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MATCHING JOB EDUCATION REQUIREMENTS OF A VARIETY OF OFFICER SPECIALTIES WITH THE EDUCATIONAL ATTAINMENTS OF POTENTIAL INCUMBENTS

By

Kenneth Goody, Sq Ldr, USAF/RAAF Exchange

OCCUPATION AND MANPOWER RESEARCH DIVISION
Brooks Air Force Base, Texas 78235

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AIR FORCE SYSTEMS COMMAND
BROOKS AIR FORCE BASE, TEXAS 78235

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This technical report has been reviewed and is approved for publication.

RAYMOND E. CHRISTAL, Technical Director
Occupation and Manpower Research Division

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The traditional methods for documenting educational achievements have limited application for prescribing desirable and mandatory educational prerequisites for Air Force specialties. Because of lack of standardization, the college transcript is an ambiguous document for this purpose. Air Force Human Resources Laboratory developed an educational profile which can be used to condense the essential information contained in the college transcript into a simple, standardized, quantified format. To establish a methodology for determining educational requirements of Air Force line officer specialties, a representative sample of 120 such profiles was prepared. These were then rated by incumbent officers on educational suitability for service in their specific specialties. The entire Navigator/Observer Utilization Field and four other specialties were included in this survey. The four other

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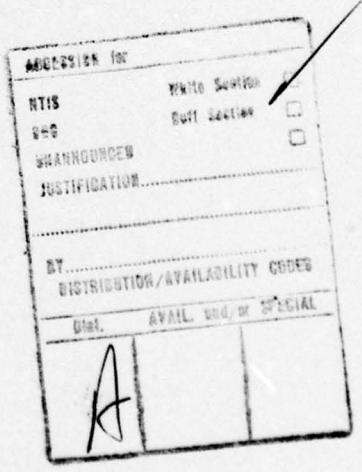
specialties were: Air Traffic Control Operations Officer, Aircraft Maintenance Officer, Transportation Officer, and Air Intelligence Officer. Sufficient raters were used to analyse five individual specialties within the Navigator/Observer Utilization Field. On confirming that the inter-rater agreement within each of these groups was satisfactory, the vector of mean ratings was accepted as a measure of educational suitability for each group. It was then shown that this measure could be predicted mathematically from a limited set of the data in the profiles by regression models, a different model being developed for each group. These regression models describe the educational requirements for the corresponding specialty, and verbal descriptions of these requirements were deduced from the regression models.

PREFACE

This research was completed under work unit 77340706, Matching Job Education Requirements with Candidates' Educational Attainments.

The author, an officer of the Royal Australian Air Force, is serving with the United States Air Force under the Officer Exchange Program.

This research would not have been possible without the help of many people. Particular appreciation is expressed to those fellow task scientists who read the manuscript and contributed numerous constructive criticisms, to Mrs. M. Joyce Giorgia for her administration of the survey and for proofing the manuscript, and to Mrs. Helen J. Widner for the excellent job of typing the draft text and tables.



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I. INTRODUCTION

Air Force Manual (AFM)-36-1 promulgates the educational background, either mandatory or preferred, for each officer specialty in the United States Air Force. These statements typically nominate a type of degree, major area of study, and specific subjects preferred. The traditional method for documenting educational achievements, the college transcript, has limited application for this purpose. There is no standard terminology or format used by the various colleges throughout the United States: for example, the same subject name is often used by different colleges for different subject matter, while at other colleges essentially the same subject matter may bear a variety of different names. The college transcript is therefore an ambiguous document. Furthermore, the presently stated USAF educational requirements have been subjectively derived and should be objectively validated.

In an attempt to overcome these limitations, the Air Force Human Resources Laboratory, Brooks Air Force Base, Texas, conducted a pilot study to test the feasibility of a more objective approach in deriving standard educational requirement profiles. The success of the pilot study, which was reported in detail by Watson and Goody (1975), led to the followup study that is the subject of this report. After a brief recapitulation of the essential findings of the pilot study, the present report will describe and discuss the method and results of this followup study.

II. BACKGROUND–THE PILOT STUDY

The first stage of the pilot study was to develop an educational profile for describing a college graduate's educational achievement in a simple, standard, quantified format. An example of a completed profile appears as Appendix A. The core of the profile is a breakdown (by semester hours) of the types of college courses completed. Twenty educational headings are used for this purpose. Their definitions are presented as Appendix B, with sufficient examples and exclusions to permit practical use. The pilot study established that courses could be assigned to these educational categories with a high degree of reliability (Watson & Goody, 1975). In addition to the number of semester hours obtained in each educational category, the profile includes the total and sub-totals of semester hours, grade point average (GPA), type of degree, major area of study and college attended.

Having developed the education profile, 100 actual profiles were prepared for the second phase of the pilot study. The cooperation of 23 officers currently serving at Lackland AFB, Texas, in the Administration Utilization Field was obtained to ascertain whether these profiles could be rated on relative suitability for assignment as administration officers. They rated against a 9-point relative scale, ranging from "most unsuitable" through "most suitable." The high inter-rater agreement obtained indicated that these officers were able to rate the profiles on relative suitability for assignment to their utilization field.

The mean rating on each profile was used as a measure of the relative suitability of the educational attainment reflected therein. The final stage of the pilot study was to ascertain whether these mean ratings could be duplicated mathematically from the quantified data contained in the profiles. *Analyses revealed that this could be done with a* satisfactory degree of accuracy, using only 10 aspects of the profiles as predictors in a multiple regression equation.

In summary, the pilot study produced a system for converting college transcripts into objective education profiles, and established that incumbent officers could rate completed profiles on educational suitability for at least one officer utilization field. It was also demonstrated that such ratings could be predicted mathematically from a subset of the data contained in the profiles. The results were sufficiently convincing to justify refining the methodology and testing its applicability to a variety of officer specialties.

III. THE SURVEY MATERIAL

Before re-using the set of 100 profiles from the pilot study, a Chi-square test was applied to test how well the various major areas of study were represented. The population used for comparison was all officers commissioned during calendar year 1973 with a bachelor's degree as the highest level of education. The results of this test were negative;

essentially the sample contained too few majors in Administration, Management and Military Science and too many in Social Sciences. In order to redress this imbalance, further profiles were selectively added, expanding the set to 120. Referring back to the original college transcripts a number of the missing GPAs were retrieved, either by conversion from another GPA system or by computation from data available on the transcript. Appendix C tabulates the essential numerical data from each of the 120 profiles used in the survey, and the non-numerical data (type of degree, major area of study and college attended) are presented as Appendix D.

A rating scale was devised to be used by incumbent officers for rating the profiles on educational suitability for their specific specialties. It appears as Appendix E. The nine points of the scale are subdivided into three broader categories—suitable, unsuitable, and borderline. The unsuitable zone covers only the bottom two points on the scale, the assumption being that relatively few college graduates would be clearly unsuitable solely on the basis of college background. At the other end of the scale, the suitable zone spans four points on the scale. While a majority of the profiles are probably suitable for service in many specialties, some will be much more suitable than others.

The survey material used for data collection comprised two booklets. One of these, sub-titled "Responses Booklet," served only as a medium for the respondents to record their ratings, some background information, and any comments they wished to make. The main survey booklet began with an explanation of what was required of the respondent and the instructions to be followed. This segment of the booklet has been reproduced as Appendix F. A copy of the Definitions of Educational Categories (as in Appendix B), and the 120 education profiles that were to be rated, followed the instructions. The rating scale was included as a foldout inside the back cover.

IV. SELECTION OF THE RATERS

The aim of this study was to refine the methodology developed in the pilot study, and then test its applicability to a variety of specialties. One complete utilization field and four other line officer Air Force specialty codes (AFSC) were selected for this purpose. They are listed in Figure 1. The rationale for these selections was to provide coverage of a variety of work types ranging from aircrew, through aircraft operations and maintenance, to support specialties less closely associated with aircraft. Variety in presently stated educational requirements was also sought. The selection of one complete utilization field, with an increased quota of respondents, was made to allow between-specialty comparisons within a utilization field. Figure 1 also contains the approximate number of respondents sought for each and the present educational requirements as stated in AFM 36-1. During the study, AFSC 6044 was combined with AFSC 6024 to form a new specialty designated AFSC 6054. The respondents selected for this category were AFSC 6044 when the sample was drawn, but almost all had been converted to AFSC 6054 by the time they participated in the survey.

For each of the categories in Figure 1, a sample was drawn randomly from active duty officers serving in appropriate duty AFSCs. To simplify and expedite administration of the survey, officers serving overseas and those projected for permanent change of station during the survey period were not considered. Seeking an optimum blend of general experience and first-hand knowledge of the day-to-day requirements of the specialty, samples were restricted to officers serving in grades first lieutenant through major.

To further reduce costs and to obtain reliable data, only volunteer respondents were used. This was achieved by drawing samples larger than needed. Each selectee was then mailed a form letter briefly outlining the project and soliciting participation. The recipients indicated willingness and availability, or otherwise, by checking boxes on the form letter which they then returned. Overall, about 66% of those approached volunteered to participate.

V. DATA GATHERING AND ANALYSIS

Survey material was mailed to each of 120 volunteers from the Navigator/Observer Utilization Field and to 65 from each of the other four selected specialties. As indicated in the instructions (Appendix F), each was asked to rate each profile in the survey booklet on educational suitability for training for and service in the duty AFSC in which the respondent was serving. The percentage of returns varied from 85% for Aircraft Maintenance Officers to 71% for Navigators/Observers.

Preliminary analyses used the procedure described by Goody (1976) to identify any divergent raters. Such raters are those who show little agreement with the majority of their group. When

AFSC	Title	Number of Respondents Sought	Present Educational Requirement as Stated in AFM 36-1.
15X5	Navigator/Observer Utilization Field	100	Bachelor of Science degree with appropriate courses in physical sciences, engineering, mathematics, administration, and management is desirable.
1634	Air Traffic Control Operations Officer Specialty	50	(1) Bachelor's degree, preferably in engineering, is mandatory, (2) Mathematics through integral and differential calculus is mandatory, (3) Graduation from UPT/UNT may be substituted for the mandatory mathematics requirement.
4024	Aircraft Maintenance Officer Specialty	50	Bachelor's degree, preferably in engineering or management, is desirable.
6044	Transportation Officer Specialty (now AFSC 6054)	50	Bachelor's degree, preferably in business administration with major in transportation or packaging, is desirable.
8054	Air Intelligence Officer Specialty	50	Bachelor's degree, preferably in social sciences; engineering; humanities; arts and education; physical sciences; mathematics; or business administration and management, is desirable.

Figure 1. **Utilization field and specialties selected for study.**

almost all of a group of raters display very high inter-rater agreement, the occasional rater who does not conform is usually deleted from further analysis. In this study, a total of 23 raters were deleted, representing about 8% of the returns. The reasons for the lack of agreement were often evident from the background information and comments provided by the respondents. There were instances of an apparent change of duty AFSC between sample selection and survey completion; this resulted in the ratings being made on suitability for a specialty other than the one intended. Some of the raters worked in very specialized areas and rated in terms of their particular job rather than the specialty as a whole. Others simply fail to adhere to the instructions. Some of those deleted could have been retained in the study without materially affecting its outcome. However, the within-specialty rater agreement among the vast majority of the raters was so high that it seemed reasonable to assume that the occasional unexplained low correlation between a rater's ratings and those of the rest of the group was the result of error variance. In confirmation of the decision to use first lieutenants through majors for the study, it was noticed that an unusually high proportion of the divergent raters were either junior lieutenants or senior majors, particularly those who had relatively little time in the duty AFSC.

Having refined the data, the main analyses were then accomplished. Within each group, treating all Navigators/Observers as a single group, the inter-rater agreement was computed using the intraclass correlation technique reported by Lindquist (1953). The mean rating on each profile (within each group) was calculated as the best measure of the educational suitability of that profile for the corresponding work area. In the pilot study, each rater's scores were standardized to a common mean and standard deviation before these computations were accomplished. In this study, however, these ratings were not standardized. Five individual specialties within the Navigator/Observer Utilization Field were adequately represented among the raters to be treated as separate specialties, as well as being included in the Navigator/Observer group. These five specialties are listed in Figure 2.

AFSC 1525	Navigator-Bombardier, Strategic
AFSC 1535	Navigator, General
AFSC 1545	Navigator, Airlift
AFSC 1555	Weapon Systems Officer
AFSC 1575	Electronic Warfare Officer

Figure 2. **Five specialties within navigator/observer utilization field also treated as separate specialties.**

The next phase of the analysis was to attempt to duplicate the mean ratings of each group mathematically from quantified aspects of the education profiles; i.e., to capture the within-group rating policies of the raters. This was achieved by a series of multiple regression analyses. As in the pilot study, the number of semester hours in each of the 20 educational categories, and the sub-totals for the five main groupings of them were considered as predictor variables. Another potential predictor variable was the GPA. A dichotomous variable, set equal to one if there is no GPA and zero otherwise, was created to allow for the absence of a GPA on 12 percent of the profiles. Eleven other dichotomous variables were created to indicate the presence or absence of each of the nine major areas of study, an arts degree, and a science degree. As in the pilot study, the 13 college quality scores (Astin, 1965) were included in the set of potential predictors to investigate whether aspects of the college attended affected the rater's judgment. Whenever it was suspected that the effect of a variable was not linear, a quadratic term was added during the analysis. The complete list of all variables considered as potential predictors appears as Appendix G. Fifty-five of them are linearly independent.

The aim of the regression analyses was to predict the mean ratings for each group as accurately as possible using a small subset of data from the profile. Only variables with positive regression weights were allowed in the final

models, except where the weight applied to one of the terms of a quadratic expression which, overall, contributed positively throughout the available range. This approach was taken as the aim was to determine what contributed to educational suitability rather than what apparently detracted from it.

A step-wise regression program was the basic computational tool used to select the optimum set or predictors. It selected the best predictor from a nominated group of predictors, and then progressively added predictors one at a time in such a way as to maximize the improvement in prediction at each step. The first application of the program included all 20 educational category scores, the two GPA variables, and the 13 college quality scores. For the second run, the number of predictors was drastically reduced by removing those with negative weights and those that entered the model last during the first run. Further runs were then accomplished, this much smaller set of predictors being progressively modified until the final model was obtained. Periodically, the predicted scores were computed and the profiles with the highest residuals were studied for clues on how to improve the predictive efficiency. Squared terms were added when a non-linear relationship was suspected. When the individual components of a subject area seemed to make similar contributions, the total score for the area was substituted for the individual components and the loss in predictive efficiency was tested for significance. Although considerable judgement was required in identifying the best set of predictors, the technique was systematic and, as will be seen, achieved the desired objective which was to produce a small regression model with high predictive efficiency for each group.

All analyses to this point measured and described similarities within groups. Differences between groups were also investigated. The criterion variables for all groups were compared by computing bivariate correlation coefficients. Two correlation matrices were computed, one for the original five groups and a second to compare the five specialties within the Navigator/Observer Utilization Field. Another series of analyses sought to determine how well the regression equation developed for one group predicted the criterion values for another group. That is, how much would be lost by using the same equation for a number of groups? This was determined by computing the correlations between the criterion scores of each group and the predicted scores from the final regression models for each of the other groups. The formula for the correlation between a variable and the sum of differentially weighted variables, as reported by Guilford (1956), was used for these calculations. Treating Navigators/Observers as one group, the weights for each group were cross-applied in this fashion to each other group. The Navigators/Observers group was then treated in isolation. The weights for each of the five specialties and for the 15X5 group as a whole were cross-applied to each of the other specialties and to the 15X5 group as a whole.

VI. RESULTS

Analyses of the within-group ratings after removal of divergent raters produced the data tabulated in Table 1. The R_{11} and R_{kk} statistics are measures of inter-rater agreement using the intraclass correlation technique. The two columns on the right of Table 1 contain the means and standard deviations, respectively, of the mean profile rating vectors for each group. The vectors of mean ratings for each of the ten groups have been reproduced as Appendix H.

Tables 2, 3, 4, 5, and 6 record the details of the final regression equation in each of the five basic groups. They list the titles of the variables that entered into each final model, and an abbreviation for them. Against each variable title is its mean, standard deviation, regression weight, and bivariate correlation with the criterion (zero order correlation or validity). At the foot of each table is the regression constant (Const), the multiple correlation coefficient (R), and the squared multiple correlation coefficient (RSQ).

The table for each regression model describes the regression equation in detail. Figures 3, 4, 5, 6, and 7 were prepared as graphical representations of the relative contribution of each variable towards educational suitability. The horizontal axis in each of these graphs is the number of semester hours in the subject area being considered. The vertical axis is a measure of the increase in the dependent variable (the predicted educational suitability) as the variable under consideration increases, all other variables being held constant. The full titles of the variables, identified on the graphs by abbreviations, are available by cross-reference to the corresponding table. Each of these graph lines is plotted only for the range of values which occur in the data set. The dotted horizontal lines on some of the graphs depict the relative contribution of dichotomous variables indicating the presence or absence of some

Table 1. **Summary of Ratings by Groups**

	Group	Number of Raters Before Deletions	Number of Raters After Deletions	R_{11}	R_{kk}	Mean	SD
AFSC 15X5	Navigator/Observer Utilization Field	85	80	.453	.985	5.20	1.349
AFSC 1525	Navigator-Bombardier, Strategic Specialty	18	16	.406	.916	5.20	1.275
AFSC 1535	Navigator, General Specialty	11	11	.348	.854	5.29	1.313
AFSC 1545	Navigator, Airlift Specialty	15	15	.476	.932	5.50	1.374
AFSC 1555	Weapon Systems Officer Specialty	14	13	.475	.922	5.30	1.378
AFSC 1575	Electronic Warfare Officer Specialty	27	24	.452	.952	4.95	1.433
AFSC 1634	Air Traffic Control Operations Officer Specialty	53	49	.241	.940	4.94	.956
AFSC 4024	Aircraft Maintenance Officer Specialty	55	52	.316	.960	4.71	1.128
AFSC 6044	Transportation Officer Specialty	51	50	.441	.975	4.70	1.372
AFSC 8054	Air Intelligence Officer Specialty	47	37	.397	.961	4.98	1.268

Table 2. **Regression Model for AFSC 15X5 – Navigator/Observer Utilization Field**

Abbreviation	Variable Title	Mean	SD	Weight	Validity
MTH(tot)	Total Mathematics	14.23	11.64	.1192	.829
	Total Mathematics Squared			−.0015	
ENG(tot)	Total Engineering/Physics	14.77	22.40	.0570	.776
	Total Engineering/Physics Squared			−.0005	
Comp	Computer Programming or Use	1.79	4.45	.0296	.324
Bus	Business Studies	10.72	15.64	.0081	.024
Mil	Military Studies	13.68	6.98	.0172	.228
Const = 3.13		RSQ = .934			R = .966

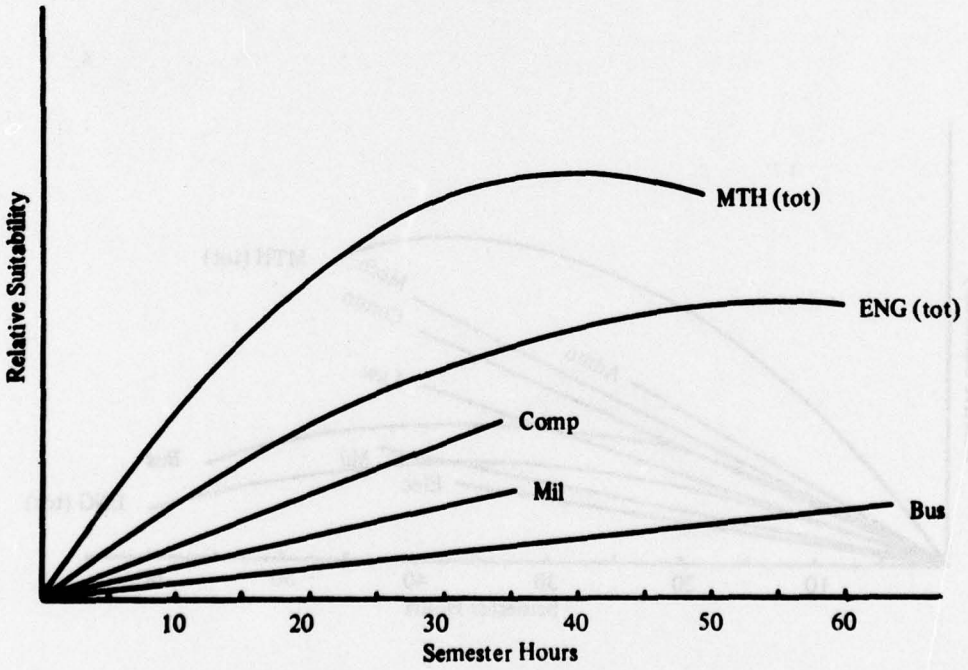

Figure 3. **Relative contribution of individual variables–AFSC 15X5 navigator/observer utilization field.**

Table 3. **Regression Model for AFSC 1634 – Air Traffic Control Operations Officer**

Abbreviation	Variable Title	Mean	SD	Weight	Validity
MTH(tot)	Total Mathematics	14.23	11.64	.0954	.722
	Total Mathematics Squared			−.0013	
ENG(tot)	Total Engineering/Physics	14.77	22.40	.0282	.558
	Total Engineering/Physics Squared			−.0004	
Mech	Mechanical Engineering	1.03	3.18	.0366	.421
Elec	Elec/Electr Engineering	3.07	10.42	.0125	.354
Bus	Business Studies	10.72	15.64	.0422	.307
	Business Studies Squared			−.0006	
Comm	Basic Communications Skills	7.68	5.08	.0329	−.021
Admn	Administration or Management	1.99	3.31	.0399	.384
Law	Law	1.53	3.75	.0233	.233
Mil	Military Studies	13.68	6.98	.0143	.210
Const = 2.99		RSQ = .874			R = .935

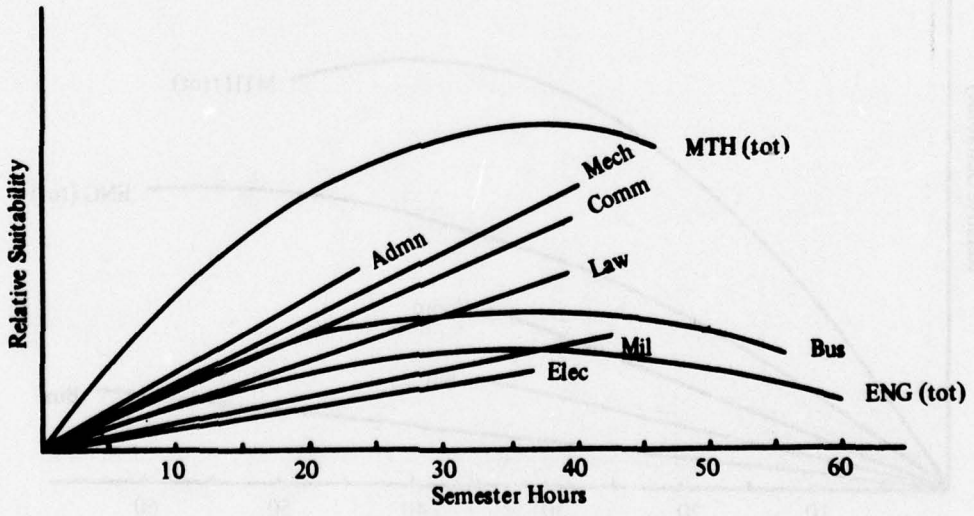

Figure 4. **Relative contribution of individual variables–AFSC 1634 air traffic control operations officer.**

Table 4. **Regression Model for AFSC 4024 – Aircraft Maintenance Officer**

Abbreviation	Variable Title	Mean	SD	Weight	Validity
MTH(tot)	Total Mathematics	14.23	11.64	.0855	.647
	Total Mathematics Squared			−.0012	
ENG(tot)	Total Engineering/Physics	14.77	22.40	.0346	.600
	Total Engineering/Physics Squared			−.0004	
Mech	Mechanical Engineering	1.03	3.18	.0744	.518
Bus	Business Studies	10.72	15.64	.0678	.355
	Business Studies Squared			−.0009	
Comm	Basic Communication Skills	7.68	5.08	.0246	−.073
Admn	Administration or Management	1.99	3.31	.0369	.416
Mil	Military Studies	13.68	6.98	.0157	.191
Law	Law	1.53	3.75	.0253	.230
Const = 2.63		RSQ = .877			R = .937

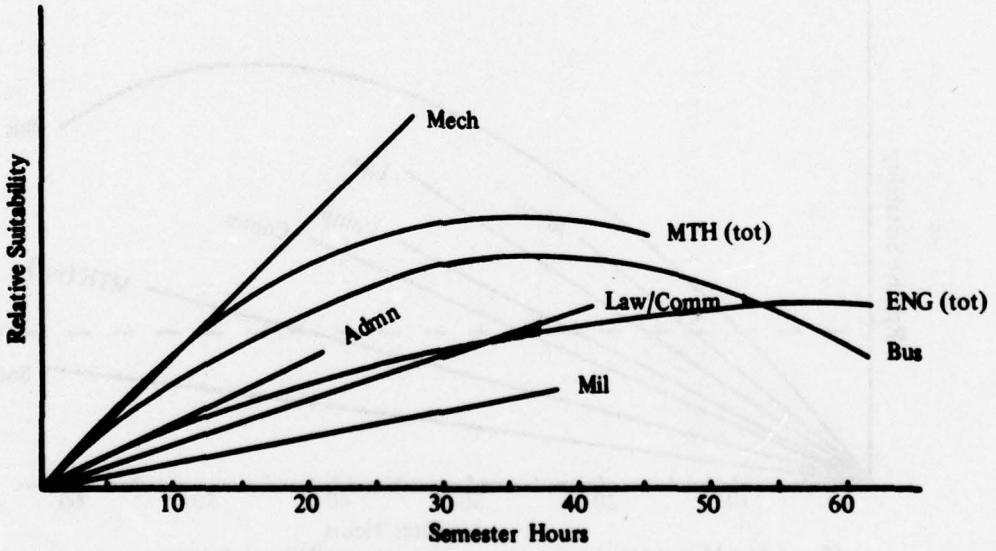

Figure 5. **Relative contribution of individual variables–AFSC 4024 aircraft maintenance officer.**

Table 5. **Regression Model for AFSC 6044 – Transportation Officer**

Abbreviation	Variable Title	Mean	SD	Weight	Validity
Bus	Business Studies	10.72	15.64	.1046	.856
	Business Studies Squared			−.0012	
	Major in Admin, Manag, Mil Sci (1, or 0)	.18	.38	.8316	.827
Admn	Administration or Management	1.99	3.31	.0641	.716
Law	Law	1.53	3.75	.0499	.530
Comp	Computer Programming or Use	1.79	4.45	.0379	.217
Comm	Basic Communication Skills	7.68	5.08	.0319	.068
MTH(tot)	Total Mathematics	14.23	11.64	.0200	.154
Stat	Probability or Statistics	1.83	2.49	.0306	.473
Soc	Soc, Behav, Educ or Pol Sci	28.40	21.83	.0102	−.226

Const = 2.73 RSQ = .933 R = .966

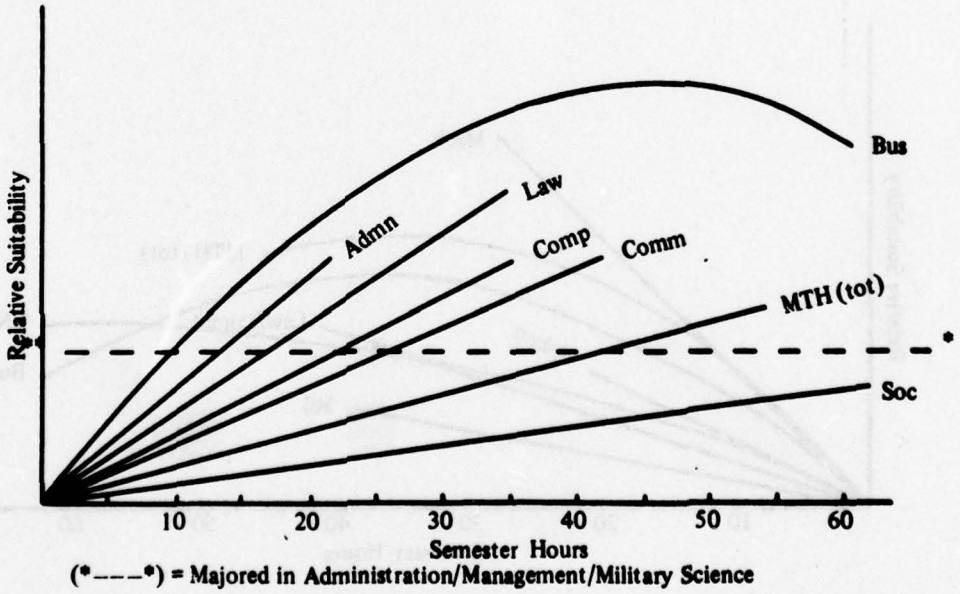

Figure 6. **Relative contribution of individual variables–AFSC 6044 transportation officer.**

Table 6. **Regression Model for AFSC 8054 – Air Intelligence Officer**

Abbreviation	Variable Title	Mean	SD	Weight	Validity
Soc	Soc, Behav, Educ, or Pol Sci	28.40	21.83	.0568	.743
	Soc, Behav, Educ, Pol Sci Squared			−.0004	
	Major in Social Sciences (1, or 0)	.20	.40	1.5696	.774
	Arts Degree (1, or 0)	.44	.50	.4257	.586
Comm	Basic Communication Skills	7.68	5.08	.0492	.205
Bus	Business Studies	10.72	15.64	.0110	−.036
Mil	Military Studies	13.68	6.98	.0210	−.104
Law	Law	1.53	3.75	.0368	.054
Const = 2.59		RSQ = .851			R = .923

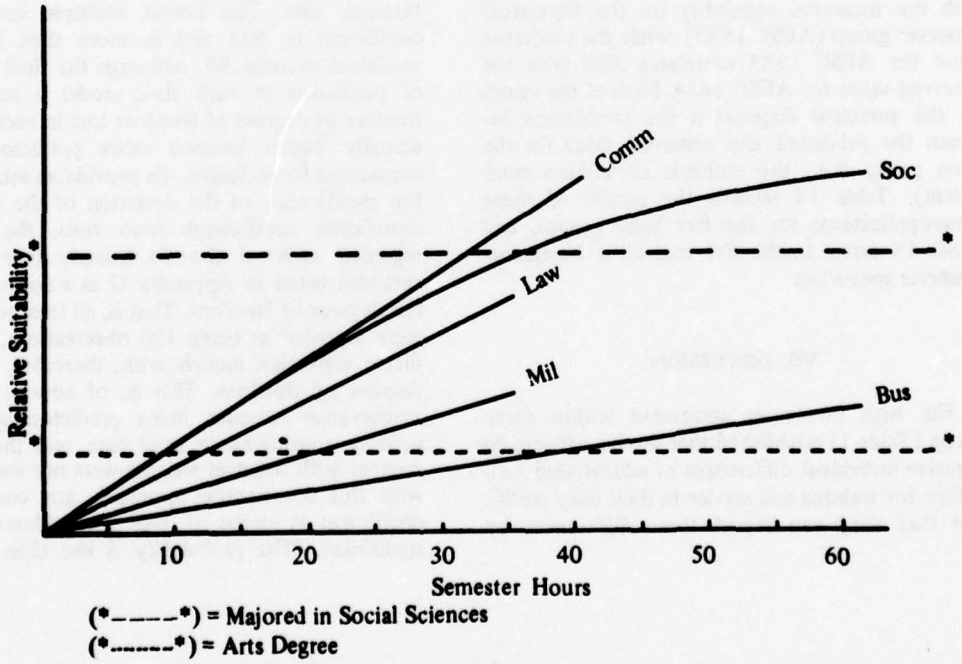

Figure 7. **Relative contribution of individual variables–AFSC 8054 air intelligence officer.**

attribute. If the attribute exists (variable = 1), the dotted line represents the relative contribution to educational suitability; if it does not exist (= 0), its relative contribution is zero.

The final regression equations for the five individual specialties analyzed within the Navigator/Observer Utilization Field are presented in Tables 7, 8, 9, 10, and 11, in the same format that was used for the five basic groups. For each, the graphs of the relative contributions of each variable in each model were prepared. They are presented as Figures 8, 9, 10, 11, and 12.

The between-group correlation matrix for the five basic groups appears as Table 12. Each entry in the table is the correlation coefficient between the vectors of mean ratings for the two corresponding groups of raters. Table 13 is a similar table for the comparisons among the five individual specialties within the Navigator/Observer Utilization Field.

Although they contain correlation coefficients, Tables 14 and 15 are not correlation matrices in the normal sense. The columns of the tables refer to criterion scores and the rows contain the predicted scores associated with the corresponding regression model. For example, Table 14 indicates that the correlation between the predicted educational suitability for Air Traffic Control Operations Officer (AFSC 1634) correlates .883 with the measured suitability for the Navigator/Observer group (AFSC 15X5), while the predicted value for AFSC 15X5 correlates .826 with the observed value for AFSC 1634. Each of the values on the principal diagonal is the correlation between the predicted and observed value for the same group (i.e., the multiple correlation coefficient). Table 14 records the results of these cross-applications for the five basic groups, and Table 15 refers to the five individual Navigator/Observer specialties.

VII. DISCUSSION

The high inter-rater agreement within every group (Table 1) established that serving officers do perceive individual differences in educational suitability for training and service in their duty AFSC, and that they can report these differences by rating educational profiles against the scale provided.

The ultimate operational application of this research would require further development of this methodology, and application of it to each Air Force line officer specialty to develop a regression model for each. An educational profile would be prepared on each potential assignee, and a computerized algorithm would apply the weights from each regression model to compute an educational suitability index for each AFSC. Such indexes could then be used as one of the components in an overall, computerized assignment model that would predict the pay-off of each individual in each specialty. This would result in a much better match between the talents possessed by a candidate, including education, and the job ultimately assigned; and could be applied equally to officers entering the Air Force and to those eligible for reassignment. Such a model could be analogous to the Air Force Human Resources Laboratory's person-job-match system. This system computes the pay-off of each individual enlisted applicant for each Air Force specialty or job and displays, in descending order, the best 15 jobs.

The acceptability of the regression models for computing educational suitability indexes is evident from Tables 2 through 11. The number of data items used to form profiles ranges from five through nine. The lowest multiple correlation coefficient is .923 and in more than half the models it exceeds .95. Although the final number of predictors in each final model is small, the number of degrees of freedom lost in each case is actually higher because other predictors were considered for inclusion. To provide an estimate of the significance of the deviation of the multiple correlation coefficients from zero, the analyst regarded each of the 54 linearly independent variables listed in Appendix G as a constraint on the degrees of freedom. That is, all final equations were regarded as being 120 observations, 55 predictor regression models with, therefore, only 66 degrees of freedom. This is, of course, a most conservative estimate. Many predictors were not actively considered in each case, and those that entered with negative weights were not used. Even with this conservative approach, any correlation coefficient in excess of .848 is considered highly significant. (The probability is less than .00001

Table 7. **Regression Model for AFSC 1525 – Navigator-Bombardier, Strategic**

Abbreviation	Variable Title	Mean	SD	Weight	Validity
MTH(tot)	Total Mathematics	14.23	11.64	.1009	.842
	Total Mathematics Squared			−.0011	
ENG(tot)	Total Engineering/Physics	14.77	22.40	.0437	.732
	Total Engineering/Physics Squared			−.0003	
Aero	Aerospace Engineering	.51	3.24	.0343	.304
Comp	Computer Programming or Use	1.79	4.45	.0356	.352
Mil	Military Studies	13.68	6.98	.0202	.241
Bus	Business Studies	10.72	15.64	.0090	.044
Const = 3.26		RSQ = .908			R = .953

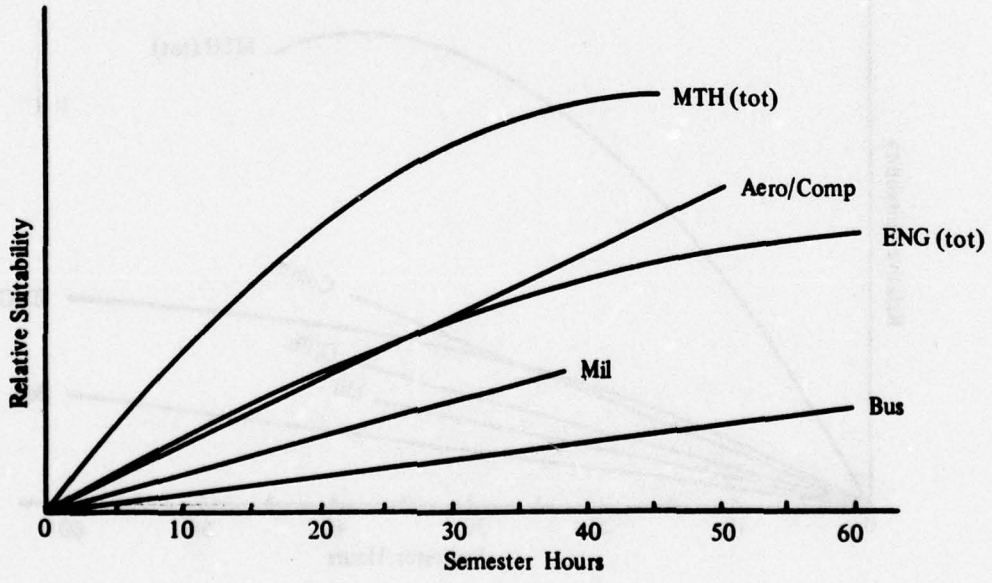

Figure 8. **Relative contribution of individual variables–AFSC 1525 navigator-bombardier, strategic.**

Table 8. **Regression Model for AFSC 1535 – Navigator, General**

Abbreviation	Variable Title	Mean	SD	Weight	Validity
MTH(tot)	Total Mathematics	14.23	11.64	.1345	.833
	Total Mathematics Squared			–.0017	
ENG(tot)	Total Engineering/Physics	14.77	22.40	.0367	.686
	Total Engineering/Physics Squared			–.0003	
O/Ph	Other Physical Sciences	8.63	7.95	.0204	.355
Mil	Military Studies	13.68	6.98	.0153	.217
Comp	Computer Programming or Use	1.79	4.45	.0286	.339
Bus	Business Studies	10.72	15.64	.0100	.062
Const = 3.09		RSQ = .898			R = .948

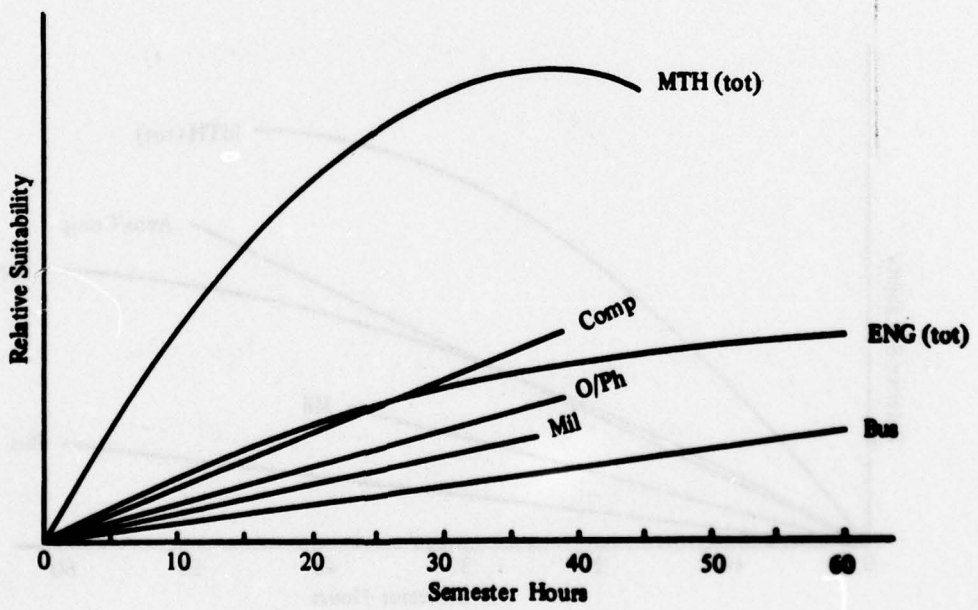

Figure 9. **Relative contribution of individual variables–AFSC 1535 navigator, general.**

Table 9. **Regression Model for AFSC 1545 – Navigator, Airlift**

Abbreviation	Variable Title	Mean	SD	Weight	Validity
MTH(tot)	Total Mathematics	14.23	11.64	.1499	.838
	Total Mathematics Squared			−.0020	
ENG(tot)	Total Engineering/Physics	14.77	22.40	.0421	.708
	Total Engineering/Physics Squared			−.0004	
Bus	Business Studies	10.72	15.64	.0121	.091
Comp	Computer Programming or Use	1.79	4.45	.0285	.333
O/Ph	Other Physical Sciences	8.63	7.95	.0142	.323
Const = 3.37		RSQ = .921			R = .959

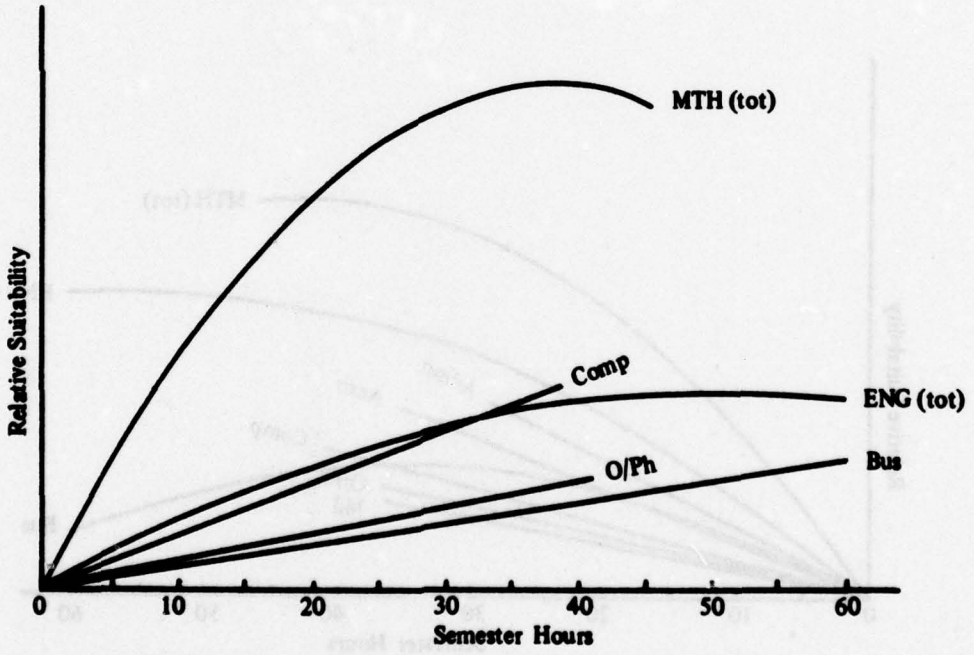

Figure 10. **Relative contribution of individual variables–AFSC 1545 navigator, airlift.**

Table 10. **Regression Model for AFSC 1555 – Weapon Systems Officer**

Abbreviation	Variable Title	Mean	SD	Weight	Validity
MTH(tot)	Total Mathematics	14.23	11.64	.1073	.795
	Total Mathematics Squared			−.0013	
ENG(tot)	Total Engineering/Physics	14.77	22.40	.0635	.724
	Total Engineering/Physics Squared			−.0006	
Aero	Aerospace Engineering	.51	3.24	.0297	.287
Admn	Administration or Management	1.99	3.31	.0376	.182
Mil	Military Studies	13.68	6.98	.0139	.199
Comp	Computer Programming or Use	1.79	4.45	.0195	.311
Bus	Business Studies	10.72	15.64	.0414	.076
	Business Studies Squared			−.0006	
O/PH	Other Physical Sciences	8.63	7.95	.0166	.327

Const = 3.05 RSQ = .909 R = .953

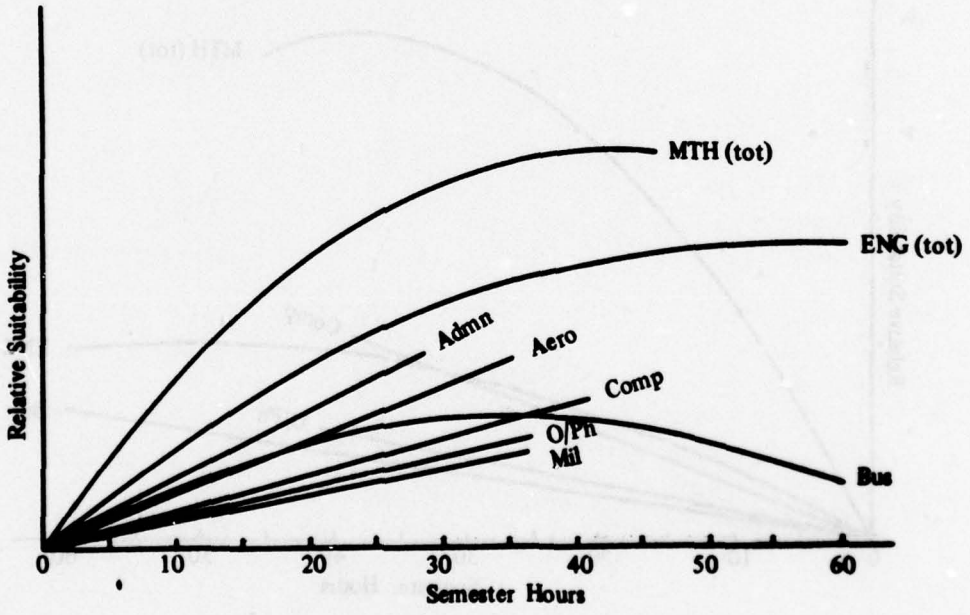

Figure 11. **Relative contribution of individual variables–AFSC 1555 weapon systems officer.**

Table 11. **Regression Model for AFSC 1575 – Electronic Warfare Officer**

Abbreviation	Variable Title	Mean	SD	Weight	Validity
ENG(tot)	Total Engineering/Physics	14.77	22.40	.0631	.849
	Total Engineering/Physics Squared			−.0006	
Elec	Electrical/Electronic Engineering	3.07	10.42	.0329	.612
MTH(tot)	Total Mathematics	14.23	11.64	.1014	.778
	Total Mathematics Squared			−.0013	
Mil	Military Studies	13.68	6.98	.0213	.244
Comp	Computer Programming or Use	1.79	4.45	.0310	.282
Const = 2.97		RSQ = .956			R = .978

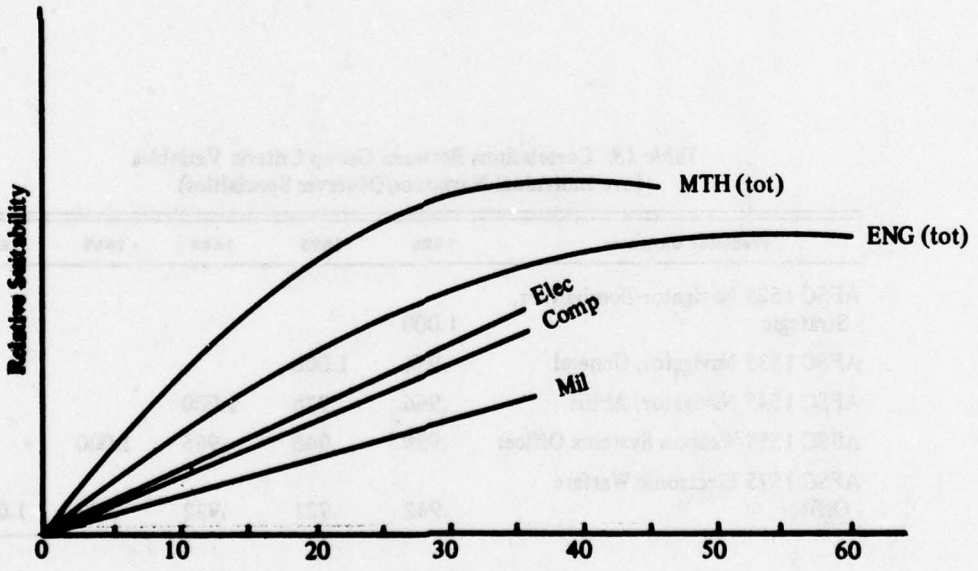

Figure 12. **Relative contribution of individual variables–AFSC 1575 electronic warfare officer.**

Table 12. **Correlations Between Group Criteria Variables (Five Basic Groups)**

Predictor Variables	15X5	1634	4024	6044	8054
AFSC 15X5 Navigator/Observer Utilization Field	1.000				
AFSC 1634 Air Traffic Control Operations Officer Specialty	.889	1.000			
AFSC 4024 Aircraft Maintenance Officer Specialty	.856	.962	1.000		
AFSC 6044 Transportation Officer Specialty	.162	.522	.542	1.000	
AFSC 8054 Air Intelligence Officer Specialty	−.567	−.383	−.382	.110	1.000

Table 13. **Correlations Between Group Criteria Variables (Five Individual Navigator/Observer Specialties)**

Predictor Variables	1525	1535	1545	1555	1575
AFSC 1525 Navigator-Bombardier, Strategic	1.000				
AFSC 1535 Navigator, General	.956	1.000			
AFSC 1545 Navigator, Airlift	.966	.978	1.000		
AFSC 1555 Weapon Systems Officer	.959	.946	.965	1.000	
AFSC 1575 Electronic Warfare Officer	.942	.921	.932	.922	1.000

Table 14. **Correlations Between Predicted Variables and Criterion Variables for Five Basic Groups**

Predictor Variables	Criterion Variables				
	15X5	1634	4024	6044	8054
AFSC 15X5 Navigator/Observer Utilization Field	*.966	.826	.806	.134	–.604
AFSC 1634 Air Traffic Control Operations Officer Specialty	.883	*.935	.919	.500	–.489
AFSC 4024 Aircraft Maintenance Officer Specialty	.854	.912	*.937	.521	–.491
AFSC 6044 Transportation Officer Specialties	.135	.467	.493	*.966	.039
AFSC 8054 Air Intelligence Officer Specialty	–.661	–.508	–.493	.024	*.923

Table 15. **Correlations Between Predicted Variables and Criterion Variables for the Navigator/Observer Group**

Predictor Variables	Criterion Variables					
	15X5	1525	1535	1545	1555	1575
AFSC 15X5 Group as a Whole	*.966	.946	.935	.951	.934	.950
AFSC 1525 Navigator-Bombardier, Strategic	.962	*.953	.932	.949	.932	.938
AFSC 1535 Navigator, General	.959	.942	*.948	.959	.933	.924
AFSC 1545 Navigator, Airlift	.957	.937	.943	*.959	.933	.920
AFSC 1555 Weapon Systems Officer	.962	.941	.936	.954	*.953	.928
AFSC 1575 Electronic Warfare Officer	.950	.919	.896	.908	.897	*.978

that such a value could occur by chance if the true value were, in fact, zero.)

The feasibility of using this methodology, after further development, to compute educational suitability indexes as part of an overall computerized assignment model has, therefore, been established. Further development is required as only 120 profiles were used. Although the sample of profiles was stratified by major area of study, and the predictive efficiency of each of the regression equations was very high, a larger set of profiles is desirable for complete testing before implementation of the methodology. About 500 profiles should be prepared and presented in subsets of about 100. Different raters would rate each subset for each AFSC, but the net result would be 500 data points (mean ratings) for computing the regression equations.

In addition to establishing the feasibility of the ultimate operational application of this research, the results also have a more immediate payoff. Each regression model contains objectively derived information on what educational achievements were seen by the raters as being desirable for their specific duty AFSC. It is possible to translate each model into a verbal, qualitative description of the educational background desirable for the corresponding specialty or utilization field. Each of these may then be compared with the educational requirements, presently prescribed in AFM 36-1, with a view to validation and possible amendment. To illustrate this possible application, suggested descriptions for the five main groups surveyed are offered in the following pages. Each is presented in a format similar to that used in AFM 36-1, but no opinion is offered on whether the main suggested educational requirement should be mandatory or only highly desirable. It would be presumptuous to make such a recommendation on the basis of these data. Before discussing each specialty/utilization field individually, some comments will be made on the general nature of the equations.

The first general comment is that the raters gave more weight to the types of courses and numbers of semester hours taken, rather than where they were taken and what proficiency level (GPA) was demonstrated. In no case did the college quality scores or the GPA account for any criterion variance that could not be accounted for by other variables.

While the raters were generally very clear about which subject areas were valuable, they disliked too high a degree of specialization. The curvilinear effects of the major predictors in each model testify to this conclusion. Addition of a few semester hours for the more desirable subjects contributes strongly to educational suitability when the profile contains only a few hours in that area. However, as the total number of hours in the subject area increases, the marginal effect of adding more hours tapers off as a point of diminishing returns is approached.

In many of the models, some data items from the profiles have a dual role in the prediction model. Very often the total number of hours in a broad area such as Engineering/Physics is a very strong predictor, with individual subjects within the group being more important than others. For example, adding hours of Engineering/Physics improves educational suitability for Air Traffic Control Operations Officer, until the point of diminishing returns is reached (Figure 4). If the added hours are in Mechanical or Electrical/Electronic Engineering, there is an increase in educational suitability over and above the effect of increasing the total hours in Engineering/Physics.

The suggested educational background desired for the Navigator/Observer Utilization Field as a whole may be inferred from Table 2 and Figure 3. Hours in Mathematics and Engineering/Physics are the most sought-after qualifications. This is in substantial agreement with the presently stated requirements (Figure 1). The other positive contributers to educational suitability are Computer Programming or Use, Military Studies, and Business Studies. The presently stated preference for a science degree is not supported by the data. Possession of a science degree does correlate .52 with educational suitability, but this is explained by its positive correlations with Mathematics and Engineering/Physics rather than some intrinsically beneficial effect; the raters considered the subjects actually studied rather than type of degree. Similarly, the inclusion of Administration or Management, as defined in Appendix B, in the model could not be justified. Instead the raters were content with Business and Military Studies generally. The educational requirements for the Navigator/Observer Utilization Field could perhaps better be stated as follows:

> Bachelor's degree with units in mathematics and physics or engineering is mandatory/highly desirable. Units in computational sciences, military studies and business studies are also desirable.

Table 3 and Figure 4 contain the results of the regression analysis for Air Traffic Control Operations Officer. Again Mathematics and Engineering/Physics are very important, particularly Mechanical, Electrical and Electronic Engineering. The other important subjects are

Administration, Management, Basic Communication Skills, Business Studies, Law and Military Studies. The emphasis on calculus in the presently stated requirement is not supported by the data. A better statement of the educational requirements for Air Traffic Control Operations Officer might be as follows:

> Bachelor's degree, preferably with units in mathematics, engineering (particularly mechanical, electrical and electronic engineering) or physics, administration or management, and basic communication skills, is mandatory/highly desirable. Units in business studies, law and military science are also desirable.

As the mandatory calculus requirement has been omitted there would be no need for the UPT/UNT waiver to be included.

Aircraft Maintenance Officers prefer Mathematics, Business Studies and Engineering/Physics, particularly Mechanical Engineering (Table 4 and Figure 5). Administration or Management, Basic Communication Skills, Law and Military Studies are the other variables entering the model. This seems to be fairly consistent with the presently stated requirement (Figure 1). However, the requirements could be more explicitly stated as follows:

> Bachelor's degree, preferably with units in mathematics, engineering (particularly mechanical engineering) or physics, and business studies is mandatory/highly desirable. Units in administration or management, basic communication skills, law and military studies are also desirable.

A dichotomous variable, representing the presence or absence of a particular stated major area of study, enters the model for Transportation Officer (Table 5 and Figure 6). The preferred subjects are evident in the graph. The dichotomous variable indicates that the raters gave a profile more weight if the stated major area of study was Administration, Management or Military Sciences. It may be assumed they sought Administration and Management; Military Studies did not contribute significantly to the model, even when the dichotomous variable was excluded. However, it would be difficult to explicitly specify such a major in a verbal statement of educational requirements without detracting from the contributions of the other major predictors. The following is suggested as a possible statement of educational requirements for Transportation Officer:

> Bachelor's degree, preferably with units in administration, management and business studies, is mandatory/highly desirable. Units in law, computational sciences, basic communication skills, mathematics, and social, behavioral, educational or political sciences are also desirable.

Apart from the addition of some desirable subjects, this is very similar to the presently stated requirement. Although this data set does not permit testing of the specific reference to "transportation or packaging," its addition to the above statement could probably be justified. Whether these findings apply equally to the new AFSC (6054) as they do to the obsolete AFSC (6044) is a matter for conjecture. Short of gathering more data, it would seem reasonable to accept at least the verbal description just stated.

The requirement for the majority of Air Intelligence Officers, as depicted in Table 6 and Figure 7, does not appear to be as nebulous as the presently stated requirement (Figure 1). The following is suggested as a suitable verbal description of the educational requirements for AFSC 8054 generally, based on this data set:

> Bachelor's degree, preferably an Arts degree and majoring in social and political sciences, is highly desirable. Units in basic communication skills, law, military studies, and business studies are also desirable.

However, before computing the vector of means for use as the criterion variable, a total of ten AFSC 8054 raters were deleted because of lack of agreement with the main group. Close examination of these "divergent" raters led the analyst to conclude that most of them were genuinely expressing different opinions rather than simply not cooperating. This suggests that there are a number of isolated, special cells within this specialty with an education requirement different from that described previously. Whether these special requirements should be subjectively ascertained and appended to the above suggested statement of educational requirements is a matter for policy decision.

Similar detailed analyses could be made of the tables and graphs for the individual navigation specialties (Tables 7 through 11 and Figures 8 through 12). Such analyses will not be detailed in this report. Instead, some brief comments will be offered on the similarities and differences between them. Note the similarity of the contributions of Mathematics, Engineering/Physics and Computer Programming or Use; and of Military and Business Studies, except for Airlift Navigators and Electronic Warfare Officers respectively. The differences between them are a positive contribution of other Physical Sciences for general and airlift navigators and for Weapon Systems Officers, who also considered units in Aerospace Engineering and Administration or Management to be useful. Navigators-Bombardiers, Strategic also find

Aerospace Engineering beneficial, and Electronic Warfare Officers prefer Electrical/Electronic Engineering.

It has now been established that educational suitability for each specialty can be measured, and these measures can be predicted mathematically. The prediction systems so devised can also be translated into verbal specifications. It remains to be discussed whether the requirements of the various specialties are actually different. Tables 12 through 15 were prepared for this purpose.

The correlation of .962 (Table 12) between the criterion vectors for Air Traffic Control Operations Officers and for Aircraft Maintenance Officers indicates these are the two most similar members of the five basic groups. Table 14 shows that the optimum models for these two specialties have validities of .935 and .937, respectively, while each can be predicted from the model for the other with respective validities of .912 and .919, respectively. Guilford's (1956) z-test for differences between these correlation coefficients was not significant at the 5 percent level. That is, there is insufficient evidence that the educational requirements for Air Traffic Control Officer and Aircraft Maintenance Officer are not identical. A model for predicting educational suitability for these two specialties combined was computed and is reported in Table 16, supported by Figure 13.

Table 12 indicates considerable similarity between the requirements for the navigator group as a whole and these two specialties (correlations of .889 and .856). Again, the z-test was applied to the validities obtained from cross-applications (Table 14) to test the hypotheses that the navigator regression model is actually the same as the models for Air Traffic Control Operations Officers and Aircraft Maintenance Officers. This hypothesis can be rejected at the 1% level of significance. While the Navigator/Observer Utilization Field model may be similar to those for the other two aircraft related specialties, it is significantly different. From Tables 12 and 14 it is clear that the educational requirements for Transportation Officer and for Air Intelligence Officer are clearly different from the requirements of the other three basic groups, as they are from each other.

Having considered the differences and similarities between the five basic groups, the individual components of the navigator group shall be considered. Table 13 suggests that airlift and general navigators are most alike. Table 15 shows that the loss of predictive efficiency by cross-applying the models for these two specialties is negligible. In fact, the first four specialties (AFSCs 1525, 1535, 1545, and 1555) all seem to be similar, and application of the z-test to the validities stemming from cross-applications of weights does not permit rejection of the hypotheses of no predictive efficiency loss. That is, the requirements for these four specialties are probably the same. The requirement for Electronic Warfare Officer is, however, a different matter. The criterion for this AFSC can be predicted with a multiple correlation coefficient of .978, the highest for the entire study. This indicates that the 24 raters from this specialty were very definite and systematic in selection of those profiles suitable for the Electronic Warfare Officer specialty. The significance of the loss in predictive efficiency by applying the equations for the other four navigator specialties to the Electronic Warfare Officer criterion vector, and by applying the AFSC 1575 model to the other four models, was tested by the z-test. All can safely be rejected at the 1 percent level of significance, except for application of the AFSC 1575 model to AFSC 1525 which can be rejected at the 2% level of significance. While it is similar, the educational requirement for Electronic Warfare Officer is significantly different from that of the other four navigator specialties in this study. On the other hand, there is insufficient evidence of a difference between the models for these other four specialties. A model for these four combined was computed, the results being presented as Table 17 and Figure 14.

VIII. CONCLUSIONS AND RECOMMENDATIONS

The methodologies for condensing the data in college transcripts into standard, simple, quantified education profiles, and having such profiles rated on educational suitability for various specialties, have now been established. Appendices to this report contain all the data necessary to recreate the survey material used in this study. This survey could therefore be accomplished on any other specialty. Before such application, however, the set of profiles should be expanded to 500 and subdivided into sets of 100 as previously discussed. Detailed instructions for preparing profiles from transcripts were published as an appendix to the report on the pilot study (Watson & Goody, 1975).

This report establishes the feasibility of computing indices of educational suitability, although the number of data points used should be increased before further application. These indices could ultimately be applied as components of an overall, computerized model for matching officers

Table 16. **Regression Model for AFSCs 1634 and 4024 Combined**

Abbreviation	Variable Title	Mean	SD	Weight	Validity
MTH(tot)	Total Mathematics	14.23	11.64	.0901	.687
	Total Mathematics Squared			−.0013	
ENG(tot)	Total Engineering/Physics	14.77	22.40	.0321	.587
	Total Engineering/Physics Squared			−.0004	
Mech	Mechanical Engineering	1.03.	3.18	.0581	.480
Elec	Elec/Electr Engineering	3.07	10.42	.0098	.354
Admn	Administration or Management	1.99	3.31	.0389	.406
Comm	Basic Communication Skills	7.68	5.08	.0285	−.050
Bus	Business Studies	10.72	15.64	.0552	.337
	Business Studies Squared			−.0008	
Mil	Military Studies	13.68	6.98	.0149	.201
Law	Law	1.53	3.75	.0241	.234

Const = 2.81 RSQ = .885 R = .941

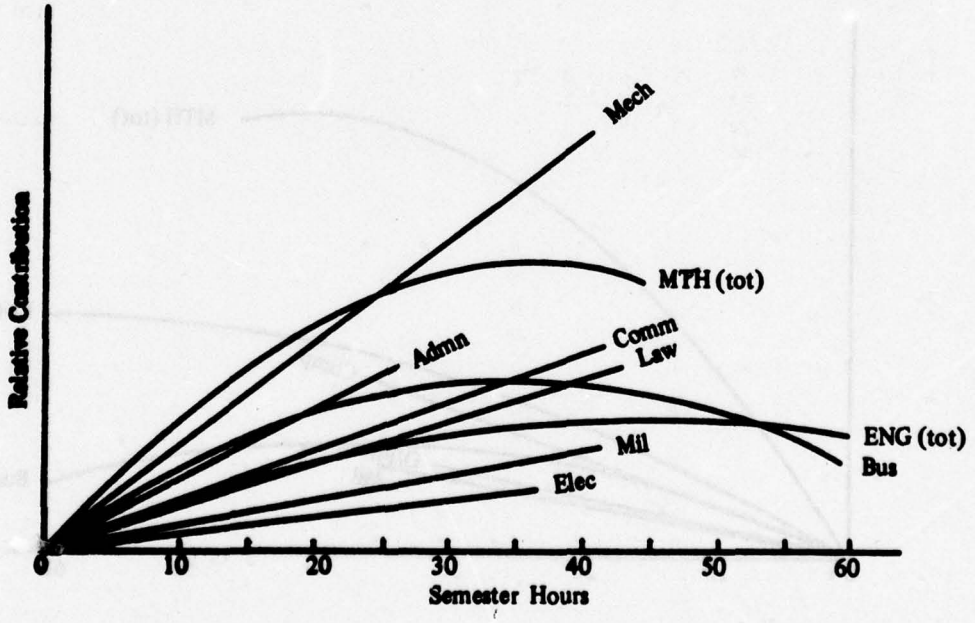

Figure 13. **Relative contribution of individual variables—AFSC 1634 and 4024 combined.**

Table 17. **Regression Model for AFSCs 1525, 1535, 1545, and 1555 Combined**

Abbreviation	Variable Title	Mean	SD	Weight	Validity
MTH(tot)	Total Mathematics	14.23	11.64	.1225	.839
	Total Mathematics Squared			−.0015	
ENG(tot)	Total Engineering/Physics	14.77	22.40	.0440	.725
	Total Engineering/Physics Squared			−.0004	
Bus	Business Studies	10.72	15.64	.0335	.069
	Business Studies Squared			−.0005	
Comp	Computer Programming or Use	1.79	4.45	.0273	.339
Mil	Military Studies	13.68	6.98	.0149	.216
O/Ph	Other Physical Sciences	8.63	7.95	.0160	.325
Const = 3.11		RSQ = .931			R = .965

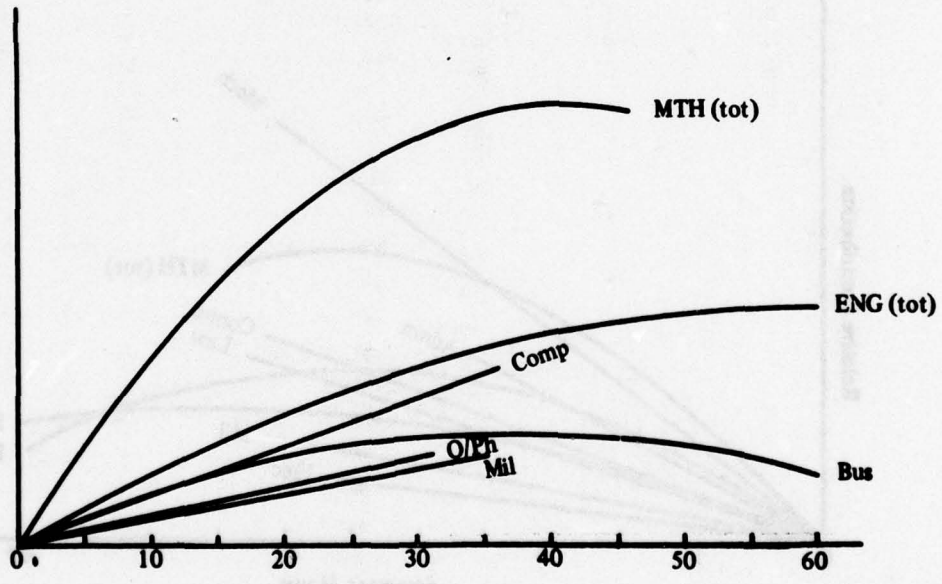

Figure 14. **Relative contribution of individual variables—AFSCs 1525, 1535, 1545 and 1555 combined.**

to jobs at both the entry and the reassignment phases of their careers. The potential use of regression analysis conducted to compute suitability indices to validate the existing educational requirements published in AFM 36-1 has been illustrated.

It is recommended that all Air Force line officer specialties be progressively surveyed using an expanded set of profiles, and that regression models be computed for each. These models may be used at a later date as part of an overall assignment model. Meanwhile, each model could be used to validate the presently stated requirements.

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APPENDIX A: SAMPLE EDUCATIONAL PROFILE

	Degree	Major	College
1	B.A.	Fine Arts	North Dakota State University
2			
3			

Education Profile		(Semester Hours)	
Math	Calculus	15	
	Probability or Statistics		
	Other Mathematics	10	25
Engineering and Physics	Aerospace Engineering		
	Mechanical Engineering	1	
	Electrical or Electronic Engineering		
	Civil or Architectural Engineering	3	
	Other Engineering	2	
	Physics		6
Other Sciences	Other Physical Sciences	4	
	Biological, Agricultural or Medical	5	
	Social, Behavioral, Educational or Political	17	
	Computer Programming or Use		26
Officer Managerial Studies	Basic Communication Skills	13	
	Administration or Management		
	Business Studies		
	Law		
	Military Studies	20	33
General Studies	Arts, Fine Arts, Humanities	61	
	Miscellaneous	4	65
Grade Point Average	2.75	Total	155

Notes:
1. Whenever a college uses other than semester hours as the unit of credit, all credits are converted to their equivalent in semester hours.
2. The Grade Point Average (GPA) is expressed in terms of a 4-point system. The maximum attainable is 4.0, and 2.0 is required to pass. Whenever a college uses a different system, it is converted. If the GPA is unobtainable, the GPA field is left blank.

APPENDIX B: DEFINITIONS OF EDUCATIONAL CATEGORIES

No.	Title	Definitions/Examples/Exclusions
1.	Calculus	Courses specifically designated Calculus. Includes composite titles such as Calculus 3 with Vectors, Analytical Geometry/Calculus I.
2.	Probability or Statistics	Courses where these topics are specifically designated or strongly implied. Includes Introductory Statistics, Business Statistics, Measurement in Education, Psychometrics, etc.
3.	Other Mathematics	Courses in Pure or Applied Math other than those previously listed. Includes various algebras and geometries, complex variable, mechanics, statics, dynamics, etc., also courses listed as Mathematics without any clarification; e.g., Math III. Excludes applied mechanics or dynamics; e.g., Thermodynamics (Physics); fluid mechanics, mechanics of vibrations (Mechanical Engineering).
4.	Aerospace Engineering	Courses studying aeronautical, astronautical or aerospace vehicles or systems. Includes aerodynamics.
5.	Mechanical Engineering	Courses specifically designated, or courses in design and construction of non-flying machines. Includes fluid dynamics, vibration mechanics, etc.
6.	Electrical or Electronic Engineering	Includes computer design.
7.	Civil or Architectural Engineering	Courses specifically designated, or courses in design and construction of buildings, towns, etc.
8.	Other Engineering	Includes all engineering courses not previously listed; e.g., Chemical, Industrial, Human Factors, Systems, Safety, Drafting, Engineering I (unspecified), Engineering Laboratory (unspecified), etc.
9.	Physics	Includes Engineering Science, Astronomy, Meteorology, Thermodynamics, etc.
10.	Other Physical Sciences	Includes all physical sciences other than Physics; e.g., Chemistry, Earth Science, Geology, Photography, etc.
11.	Biological, Agricultural or Medical Sciences	Includes Pharmacy.

No.	Title	Definitions/Examples/Exclusions
12.	Social, Behavioral, Educational, or Political Sciences	Includes Anthropology, History, Geography, Political Science, Sociology Psychology, Education, etc.
13.	Computer Programming or Use	Courses specifically designated. Includes Elements of Computer Programming, Mechanical Languages, etc. Excludes Computer design.
14.	Basic Communications Skills	Courses in written or oral communication skills relevant to AF jobs. Includes English composition, report writing, journalism, Freshman English (unless the transcript shows the emphasis to lie in the Fine Arts area), Fundamentals of Speech, etc. Excludes Fine Arts studies such as literature, poetry, drama, etc.
15.	Administration or Management	Courses specifically designated Administration or Management in any discipline except Military Studies. Includes Personnel Management, Engineering Management, Public Administration, etc. Excludes AFROTC Management or Administration courses.
16.	Business Studies	Includes Accounting, Economics, Marketing, Advertising, etc.
17.	Law	Excludes Military Law.
18.	Military Studies	AFROTC, etc. Includes Military Administration, Management, Law.
19.	Arts, Fine Arts, Humanities	Includes Literary Studies, Foreign Languages, art, music, philosophy, religion, etc.
20.	Miscellaneous	Courses which cannot be rationalized within the above categories. Includes Golf, Commercial Flight I, Physical Conditioning, etc.

Notes:
1. These educational categories apply in the order in which they appear. Each course is assigned to the first category for which it meets the definition.
2. The varying degrees of specificity of these educational categories are related to Air Force interest in the academic areas being described.

APPENDIX C: NUMERICAL DATA FROM 120 PROFILES USED IN STUDY

	Semester Hours																			
	Mathematics			Engineering and Physics						Other Sciences				Managerial Studies					General		
ID	Calc	Stat	O/M	Aero	Mech	Elec	Civ	O/E	Phy	O/Ph	Biol	Soc	Comp	Comm	Admn	Bus	Law	Mil	Art	Misc	GPA
1	16	5	24						30	3		20	3	7				4	18	1	2.04
2	15		10		1		3	2		4	5	17		13				20	61	4	2.75
3	4	4							8	16	24	43			1	4			23		
4	4	5	7		2			2		8		20	2	8	7		33	20	16	5	2.37
5		1	10							3	5	71		9				19	17	7	2.71
6		5	10						3		7	36	2	11		36		16	11	6	3.14
7	6		4						6	9	3	53	2	9				20	15	6	2.93
8		5	7							3	5	20	6	9		44	5	7	23	7	
9			4							8	12	21		22				23	52	1	2.68
10	4		19	6	6	3		8	13	8		12	5	6	6	18	6	16			3.12
11		5	6					2		4		28		9	5	41	5	20	20	2	2.23
12		3	21					4	8	8		9	32	10	12	12	3	16	3		2.63
13		3	6							5		14	3	8	11	45	8	16	5		2.36
14	24	7	15						3	23		32		9				19	15	2	3.54
15	6		3						11	22	44	15		9				14	21	4	
16			10						8	20	27	21	3	7				16	12	8	3.02
17	11		3						8	32		9		6				6	35		2.50
18			3		1			8		16	59	5		9	4	13	4	16	4	4	2.60
19	4		20	3	9	1		22	16	26	2	15	2	6				12	7	2	3.43
20										3	8	69		6					36		3.40
21		3	11							5		15		4	10	51	3	9	13		3.01
22			3								8	66		4	3	3		12	31	2	
23	7	6	26						10	19	8	13		6		3		20	13	2	
24		8	9						6	11	28	45		9					23	4	3.28
25		2	10							9	11	69		12					22	6	3.40
26		2								3	11	85		6		3		18	12	3	2.50
27	15					51		6	12	9		9		8		6		16	6	3	3.86
28	16		9		3	58		2	7	5		16	3	7				16	3	2	3.24
29		4	1								8	48		7		10			56		3.05
30	8		7				1	1		17	8	39	9	6					31	4	2.80
31	16	1	9		5	51	5	2	11	8		3		7	3	6		17	17	3	2.41
32											6	66	3	9			2	14	18	4	2.77
33	18	1	1		1	4		2	16	36		5		5	2	3		16	28	3	2.17
34			6								8	43		6		15		18	33	1	2.75
35	18	1	2		24	4		13	15	15	3			6	7	3		15	8	2	2.91
36	3		3							16		39		8		6		10	47	4	2.68
37			8						11	19	12	11		2				15	60	1	2.85
38		4								5	8	63		6				27	10	2	2.58
39			9							4	2	37		6	2	4		12	52		3.60
40	4	4	1						11	36	39	37		2				20	10	2	3.03
41	12		4						9	7		19	22	4		3		13	26	5	2.88
42	15	7	5	3	3	8		5	59	8		6			6	9		16	13		3.49
43	2		13		1			3	8	22	48	13	2	8				16	8		2.89
44	10				1		1	1	8	15	32	4		6				14	43	3	3.19
45			1						1	8		21		33	3		4	11	49	13	3.71
46	8		10		4	2		35	18	22		6	2	6		3		19	8		2.80
47			3							3	31	65		9				16	21	1	3.57
48		6	1							1	8	56		4				11	33	2	2.50
49	11	1	13		1	31		12	15	9		4	2	6				16	25	1	2.56
50	8		3						11	24	40	11		11				10	18	4	3.80

	Semester Hours																			
	Mathematics			Engineering and Physics						Other Sciences				Managerial Studies					General		
ID	Calc	Stat	O/M	Aero	Mech	Elec	Civ	O/E	Phy	O/Ph	Biol	Soc	Comp	Comm	Admn	Bus	Law	Mil	Art	Misc	GPA
51		3	6							3	19	24		10	6	38	6		20	4	2.12
52	17		15						41	20		15	6					16	15		2.67
53	16		12	28	11	4		3	10	8		8	2	9		7		4	2		2.10
54			6						3	7	14	72		6					34	2	2.72
55		3	6						4	11	49	6	3	8	3	12		17	6		2.59
56		6								6	1	25		8	4	41	4		29	5	
57										9	5	29		40		10			29	5	
58			3							2	5	42		8					57		
59	15		9						47	11	3	13	4	9				18	16	4	3.34
60			6							7	7	18	1	6	6	30	9	16	20		2.49
61	11		4		3		26			6		23	2	15	6	17	3	16	9	2	3.46
62	18		3			4		30	14	20		6		3	6	3		18	9	7	2.51
63		3	10						4	4	8	23		9	6	34	3	20	8	5	2.51
64			4					3	3	9	54	21		7		3		18	9	9	2.52
65			3						12		8	45		14		6	2	19	15	2	2.12
66		3	10			2		7	11	11	33	23	1	9	3	22	3	16	8	4	2.30
67			6								6	54		3	3	15		12	21		2.64
68	20	6	9			8			14			9	2	3		6		18	36	7	3.09
69									3	3	3	59		9		6	3	3	28	5	2.93
70	11		3						11	28	36	44		3				23	13	6	3.27
71	20	6	6						8	8		30	3	3	3	9		12	18	5	3.03
72		3	12							15		16		6	18	30	6	14	12	4	2.06
73	3		3								8	12			3			12	81	5	2.46
74			3						2	4	26	59		14				10	18	11	2.79
75										6		38		8				12	90	1	2.53
76			22			4	33	30	7	10		15		8				14			2.50
77			3							8	8	58		11				12	27	1	3.00
78										5	8	56		6		4		23	39	17	3.11
79										12		66		6	3	6		20	21	2	3.17
80	18	3	6			4			48	8	3	9	1	9		12		10	12	4	2.22
81		9	12								2	15		8	9	51	6	18	9	2	2.28
82	3		27		9	29		1	19	8		12	2	6	3	6		14			2.79
83										5	4	77		7		4		22	32	5	2.95
84	3								4	8	4	55	1	9		3		12	24	5	2.32
85			5							6	7	10		11	1	1		13	80	3	
86										6		66		7	3	5			46		
87			19							6		11		7	4	60		19	9	1	
88	14		12		7	42		2	18	8		12	1	6		3		10	3	4	3.37
89	10		17		3	4		42	9	23			4	6		6		16	12		3.10
90	5	4	3									48		8	2	11		18	36	1	2.73
91	18	3	6			40			17	8				3		15		18	9	3	2.74
92	21	3	21						11	7	3	9	6	9		6		18	15	4	2.68
93	14	6	9		3		45	5	14	11		6	1	6		6		14		4	2.20
94	4		4						12	14		56	4	8				32	10	1	3.32
95			6							8		42		3		9	3	18	41	2	2.90
96		3	13			3		5		10		12	3	10	9	27	3	16	24		3.30
97	12	7	9		12	5		34	11	8		9	3	3	3	15		19	3		3.22
98			4							4	10	59		8				18	12	20	2.44
99	21	3	15						8			9	3	6	3	15	3	20	27	2	3.25
100		3	6						8	4		64		3		3			33		2.20

	Semester Hours																			
	Mathematics			Engineering and Physics						Other Sciences				Managerial Studies					General		
ID	Calc	Stat	O/M	Aero	Mech	Elec	Civ	O/E	Phy	O/Ph	Biol	Soc	Comp	Comm	Admn	Bus	Law	Mil	Art	Misc	GPA
101		3	3					2			8	6		8	6	62	6	16	3	1	2.73
102		3	6							9		21		8		34	6	16	11	4	3.03
103	3		3								5	13		10	9	43	6	16	16	2	2.80
104		4	6						8			27	3	3	3	21	3	2	36	5	2.13
105	3		3							5	4	83		6					26	2	3.17
106			5							2	4	15		3				18	87	1	3.18
107	19	8	11						4	8	8	12	26	7		8		24	15	5	3.51
108	9		38						4	3	5	16	3	15		6		16	25		2.50
109	4		6					4	14	25	24	28	2	6		3			19	2	2.85
110	4		14							7		27		14	4	52	4		7	4	
111	7	6	4						18			37		11				16	53		2.54
112												33		7				20	81	8	
113			5				1	2	9	9	2	6	3	12		6		24		57	
114	15	3	6					3	3	10		18	9	6	6	15	12	8	9	4	2.42
115	3	3	22	21	12	6		7	14	10		13	2	8		3		16	11		2.65
116		8									4	20	3	4	13	49	8	15	12	6	3.17
117			4		2						16	56		11	3	5	5	14	19	2	2.83
118											2	12		6				19	125	2	2.98
119	15	6	15						5			18	5	6	3	30	3	16	18		3.57
120	4	6	4							5		13	3		3	51	3	20	50	2	2.87

Calc = Calculus
Stat = Probability/Stat.
O/M = Other Math.
Aero = Aerospace Eng.
Mech = Mechanical Eng.
Elec = Elec/Electr Eng.
Civ = Civil/Arch Eng.
O/E = Other Eng.
Phy = Physics
O/Ph = Other Physical Sci.
Biol = Biol/Agric/Med Sci.
Soc = Soc/Behav/Ed/Pol Sci.
Comp = Computer Prog/Use
Comm = Basic Comm. Skills
Admn = Admin/Management
Bus = Business Studies
Law = Law
Mil = Military Studies
Art = Art/Humanities
Misc = Miscellaneous

APPENDIX D: NON-NUMERICAL DATA FROM 120 PROFILES USED IN STUDY

ID	DEGREE	MAJOR	COLLEGE
1	B.A.	Physics	Northeastern Univ., Mass.
2	B.A.	Fine Arts	North Dakota State Univ.
3	B.A.	Psychology	Swartmore College, Penn.
4	B.S.	Fine Arts	North Dakota State Univ.
5	B.S.	Education	Pennsylvania State Univ.
6	B.A.	Economics	University of Minnesota
7	B.S.	Geography	Pennsylvania State Univ.
8	B.S.	Finance & Business Environment	University of Montana
9	B.A.	Speech	St Olaf College, Minn.
10	B.S.	Engineering	Purdue University, Ind.
11	B.S.	Business	North Dakota State Univ.
12	B.S.	Computer Tech.	Purdue University, Ind.
13	B.A.	Business Admin.	Wichita State Univ., Kansas
14	B.A.	Secondary Educ.	Evansville College, Ind.
15	B.S.	Biology	Virginia Military Institute
16	B.S.	Pre-Medical	Purdue University, Ind.
17	A.B.	Chemistry	Colby College, Me.
18	B.S.A.	Animal Science	*University of Arkansas*
19	B.S.	Petroleum Engineering	University of Tulsa, Okla.
20	B.A.	History	Iowa Wesleyan College
21	B.B.A.	Financial Economics and Management	State University of Iowa
22	B.A.	History, Political Science	Davis and Elkins College, W.Va.
23	B.S.	Mathematics	University of Oklahoma
24	B.A.	Psychology	Bemidji State College, Minn.
25	B.A.	Elem. Education	Evansville College, Ind.
26	B.A.	Social Studies	University of Wyoming
27	B.S.	Electrical and Computer Engineer.	University of Massachusetts
28	B.S.	Electronic Engin.	University of Arkansas
29	B.A.	Psychology	Bellarmine College, Ky.
30	A.B.	Geography	University of Illinois
31	B.S.	Electronics	North Dakota State Univ.
32	B.A.	Political Science	University of Tulsa, Okla.
33	B.S.	Chemistry	Grove City College, Penn.
34	A.B.	Political Science	Grove City College, Penn.
35	B.S.	Mechanical Engineering	Grove City College, Penn.

ID	DEGREE	MAJOR	COLLEGE
36	B.A.	History	Virginia Military Institute
37	B.A.	Chemistry	St Olaf College, Minn.
38	B.S.	Psychology	University of North Dakota
39	B.A.	History, German	St Martins College, Wash.
40	B.S.	Physics	Montana State University
41	B.A.	Mathematics	State University of Iowa
42	B.S.	Physics	Massachusetts Institute of Tech.
43	B.S.	Biology	Oklahoma State University of Agriculture and Applied Science
44	B.S.	Zoology	Brigham Young University, Utah
45	B.A.	Broadcasting	University of Wyoming, Laramie
46	B.S.	Chemical Engineer.	Oklahoma State University of Agriculture and Applied Science
47	B.S.	History	East Texas State College
48	B.A.	Psychology	University of Wyoming
49	B.Eng.	Electrical Engin.	Manhattan College, N.Y.
50	B.S.	Biology	Virginia Military Institute
51	B.S.	Business Administr.	Southeast Missouri State College
52	B.S.	Physics	Rensselaer Polytechnic Inst., N.Y.
53	B.S.E.	Aerospace Engineer.	University of Michigan
54	A.B.	History	Newberry College, S.C.
55	B.S.	Agriculture	Kansas State University
56	B.A.	Business Admin.	Dillard University, La.
57	B.S.	Communications	University of Illinois
58	B.A.	Government	University of Maryland
59	B.S.	Astronomy	Pennsylvania State Univ.
60	B.S.	Economics	Illinois Institute of Tech.
61	B.S.	Building Construct.	Michigan State University
62	B.S.	Metallurgical Engineering	Grove City College, Penn.
63	B.S.	Economics	South Dakota State College of Agriculture and Mechanic Arts
64	B.S.	Horticultural Sci.	Michigan State University
65	B.A.	History	University of Arkansas
66	B.S.	Agriculture	South Dakota State College of Agriculture and Mechanic Arts
67	A.B.	Social Science	St Joseph's College, Penn.
68	B.S.	Mathematics	Grove City College, Penn.
69	B.A.	Political Science	Pennsylvania State Univ.
70	B.A.	Education	University of Montana
71	B.S.	Mathematics	Grove City College, Penn.
72	B.S.	Business Admin.	Norwich University, Vt.
73	B.A.	English	University of the South, Tenn.
74	B.S.	Recreational Programs	University of Tulsa, Okla.
75	B.M.E.	Fine Arts	University of Tulsa, Okla.

ID	DEGREE	MAJOR	COLLEGE
76	B.S.	Civil Engineering	University of Iowa
77	B.A.	Political Science	University of Arkansas
78	A.B.	Physical Education	Colorado State College, Greeley
79	A.B.	Political Science	West Virginia University
80	B.S.	Physics	Virginia Military Institute
81	B.S.	Business Administr.	University of Wyoming
82	B.S.	Electrical Engin.	University of Tulsa, Okla.
83	A.B.	History	Colorado State College, Greeley
84	B.A.	Political Science	Pennsylvania State University
85	B.A.	English	Brigham Young University, Utah
86	B.A.	Political Science	University of Maryland
87	B.S.	Business Admin.	Duquesne University, Penn.
88	B.S.	Electrical Engin.	Virginia Military Institute
89	B.S.	Chemical Engineer.	Purdue University, Ind.
90	B.A.	History	University of Wyoming
91	B.S.	Electrical Engin.	Grove City College, Penn.
92	B.S.	Mathematics	Pennsylvania State University
93	B.S.	Civil Engineering	Virginia Military Institute
94	B.A.	Political Science	University of Puget Sound, Wash.
95	A.B.	Political Science	Grove City College, Penn.
96	B.S.	Economics	Purdue University, Ind.
97	B.S.	Industrial Engin.	Lehigh University, Penn.
98	B.S.	Physical Education	University of Iowa
99	A.B.	Mathematics	West Virginia University
100	B.A.	Sociology	University of Delaware
101	BSBA	Bank & Finance	University of Arkansas
102	B.S.	Pre-law	Kansas State University
103	B.S.	Marketing	Indiana University
104	B.A.	Business Admin	Loyola University, Ill.
105	B.S.	Elem. Education	State University College at Oswego, NY
106	B.M.	Music	University of Wyoming
107	B.S.	Computer Science	Ohio State University
108	B.A.	Mathematics	Texas A&M University
109	B.S.	Pre-dental	University of Idaho
110	B.A.	Business & Finance	University of Minnesota
111	B.A.	Psychology	Manhattan College, NY
112	B.A.	Fine Arts	Lawrence University, Wisc
113	B.S.	Gen. Aviation and Flight Technology	Purdue University, Ind.
114	B.A.	Business	University of Nebraska
115	B.S.	Aero Engineering	Wichita State Univ., Kansas

ID	DEGREE	MAJOR	COLLEGE
116	B.A.	Business Admin.	Michigan State University
117	B.A.	Communication	Michigan State University
118	B.A.	Art	Drake University, Iowa
119	B.S.	Bus Admin & Math	University of Detroit, Mich.
120	B.A.	Economics & Business Admin.	Bowling Green State Univ., Ohio

APPENDIX E: RATING SCALE

How suitable for training for and service in your duty AFSC is the educational attainment reflected in the education profile being considered?

Suitable	9	Extremely suitable - difficult to improve
	8	Very well suited
	7	Well suited
	6	Suited
Borderline	5	High borderline
	4	Borderline
	3	Low borderline
Unsuitable	2	Unsuited
	1	Least suitable - education of no value

APPENDIX F: EXPLANATION AND INSTRUCTIONS FROM SURVEY BOOKLET

The Air Force Human Resources Laboratory (AFHRL) has developed an "education profile" which condenses the data in college transcripts into a simplified, quantified, standardized format. This booklet contains a set of such profiles describing the college educational attainments of 120 officers recently commissioned into the USAF.

Your task is to rate each of these profiles on educational suitability for training for and service in your duty AFSC. Your ratings should be made against the 9-point scale which folds out inside the back cover of this booklet, and they should be recorded on the optical scan sheets in the accompanying Responses Booklet.

We recognize that successful performance in a specialty depends upon many factors, and educational background is perhaps far from the most important. However, in this study we are concerned only with the relative applicability of different educational backgrounds for your duty AFSC. All other factors should be considered equal for each of the 120 cases.

Definitions of the educational categories used in the education profiles are presented after the next page immediately before the first profile. These categories are mutually exclusive, and apply in the order in which they appear. For example, a subject that meets the criteria to be categorized as "Calculus" is automatically excluded from consideration for any subsequent category. The specificity of the categories varies depending on Air Force interest in the area. Engineering, for example, has been fairly finely subdivided while "Arts, Fine Arts and Humanities" is a single category.

For the purpose of these profiles, all credits other than semester hours have been converted to their equivalent in semester hours. Similarly, all grade point averages are reported using a 4-point system, four being the maximum possible and an average of two being required for graduation. In some instances this has necessitated a conversion from some other system.

Each profile lists educational degree obtained, major area of study, college or university attended, semester hours credited within each of the educational categories, and credit sub-totals for broader areas of study. The grade point average has been included when available.

INSTRUCTIONS

A. Complete the Background Information section in the front of the Responses Booklet.

B. Familiarize yourself with the Education Profiles.

Step B1. Quickly scan a few profiles to get an overall impression of the information contained in them.

Step B2. Read the Definitions of Educational Categories on the next two pages. Form an impression of what is and what isn't included in each.

Step B3. Examine 10 to 20 profiles noting the ranges of values in each of the information fields. Think about the influence each has on educational suitability for training for and service in your duty AFSC.

C. Familiarize yourself with the Rating Scale.

Step C1. Fold out the Rating Scale inside the back cover of this booklet. Leave it folded out where you can refer to it throughout your task.

Step C2. Reflect on what you are rating - "educational suitability for training for and service in your duty AFSC."

Step C3. Study the scale until you are confident you understand what each of the nine levels means.

D. Rate each of the Education Profiles in turn.

Step D1. Select the rating from the 9-point scale that best describes your impression of the suitability of the education reflected in the profile for training for and service in your duty AFSC.

Step D2. Record your rating by darkening the corresponding circle to the right of the profile number in the Responses Booklet. (Use a No. 2 Medium pencil as detection of other writing tools by the optical scanning equipment is unreliable.)

E. Add an estimate of the time taken to complete the ratings in the Background Information block.

F. Mail the Responses Booklet to us in the enclosed addressed envelope.

APPENDIX G: COMPLETE LIST OF PREDICTOR VARIABLES CONSIDERED FOR REGRESSION MODELS

Mean	SD	Variable Title	
5.21	6.91	Calculus	
1.83	2.49	Probability and Statistics	
7.19	6.86	Other Mathematics	
14.23	11.64	Total Mathematics	
336.95	481.12	Total Mathematics Squared	
.51	3.24	Aerospace Engineering	
1.03	3.18	Mechanical Engineering	
3.07	10.42	Electrical or Electronic Engineering	
.96	5.59	Civil or Architectual Engineering	
2.58	7.33	Other Engineering	
6.62	10.04	Physics	
14.77	22.40	Total Engineering/Physics	
715.82	1481.73	Total Engineering/Physics Squared	
8.63	7.95	Other Physical Sciences	
7.80	12.81	Biological, Agriculture, Medical Sciences	
28.40	21.83	Social, Behavioral, Educational, Political Science	
1279.07	1678.73	Social, Behavioral, Educational, Political Science Squared	
1.79	4.45	Computer Programming or Use	
46.62	25.79	Total Other Sciences	
2832.93	2819.93	Total Other Sciences Squared	
7.68	5.08	Basic Communication Skills	
1.99	3.31	Administration or Management	
10.72	15.64	Business Studies	
357.33	784.28	Business Studies Squared	
1.53	3.75	Law	
13.68	6.98	Military Studies	
235.36	168.41	Military Studies Squared	
35.58	21.43	Total Officer Managerial Studies	
1721.72	2079.54	Total Officer Managerial Studies Squared	
24.01	21.30	Arts, Fine Arts, Humanities	
3.48	5.90	Miscellaneous	
27.48	21.64	Total General Studies	
1219.90	2155.74	Total General Studies Squared	
.12	.32	Absence of a GPA	(1, or 0)
2.51	1.00	Grade Point Average	
7.27	3.53	Grade Point Average Squared	

Mean	SD	Variable Title	
53.73	7.45	College Intellectualism Score	
47.68	5.63	College Estheticism Score	
50.20	6.29	College Status Score	
61.03	7.25	College Pragmatism Score	
54.34	5.71	College Masculinity Score	
54.61	6.75	College Selectivity Score	
61.73	9.28	College Size Score	
60.34	7.85	College Realistic Orientation	
53.40	7.40	College Scientific Orientation	
43.02	7.03	College Social Orientation	
55.23	7.40	College Conventional Orientation	
50.70	6.27	College Enterprising Orientation	
43.94	6.55	College Artistic Orientation	
.18	.38	Major in Administration, Management, Military Science	(1, or 0)
.22	.41	Major in Art, Humanities, Education	(1, or 0)
.07	.25	Major in Biological, Agricultural Science	(1, or 0)
.17	.37	Major in Engineering	(1, or 0)
.01	.09	Major in Law	(1, or 0)
.08	.26	Major in Mathematics	(1, or 0)
.02	.13	Major in Medical Sciences	(1, or 0)
.08	.26	Major in Physical Sciences	(1, or 0)
.20	.40	Major in Social Sciences	(1, or 0)
.44	.50	Completion of an Arts Degree	(1, or 0)
.50	.50	Completion of a Science Degree	(1, or 0)

10	1634	4024	6044	8054	15X5	1525	1535	1545	1555	1575
1	5.592	5.269	3.980	3.973	6.462	6.250	6.545	6.400	6.846	6.375
2	5.755	5.173	4.560	5.595	5.637	5.250	6.091	6.200	5.538	5.500
3	4.551	4.404	4.540	5.568	4.165	3.750	4.545	4.533	3.769	4.375
4	5.796	5.500	5.760	5.541	5.375	5.250	5.636	5.867	5.385	5.083
5	4.469	4.288	4.959	5.838	4.462	4.500	4.545	4.800	4.154	4.458
6	5.327	5.462	6.860	6.189	5.175	5.000	5.545	6.000	4.615	4.958
7	5.102	4.346	4.800	7.081	5.175	5.313	5.364	5.533	5.000	4.917
8	5.082	5.231	7.060	4.865	4.875	4.937	5.545	5.467	4.538	4.500
9	4.388	3.769	4.800	5.973	3.709	3.750	3.545	3.533	3.923	4.000
10	7.143	7.808	6.260	4.649	7.787	7.625	7.727	7.933	8.000	7.708
11	5.755	5.904	7.520	4.892	5.175	5.125	5.273	5.733	5.538	4.708
12	6.327	6.385	6.820	4.892	6.662	6.375	6.727	7.133	6.692	6.500
13	5.571	5.385	7.429	4.486	4.962	4.875	5.091	5.400	5.231	4.500
14	5.490	4.365	4.408	5.432	5.775	6.000	6.455	6.067	5.538	5.333
15	4.612	4.058	3.460	3.892	5.076	5.250	5.364	5.133	5.154	4.958
16	4.490	3.923	3.220	3.946	5.075	5.250	5.000	5.267	5.308	5.000
17	4.306	3.769	3.000	3.486	5.100	4.562	5.364	5.733	5.462	4.833
18	4.184	4.538	4.160	2.838	4.462	4.437	4.273	4.533	4.692	4.375
19	5.735	5.923	3.660	3.784	6.700	6.750	7.091	6.933	7.000	6.458
20	3.306	2.654	3.260	6.676	2.950	2.875	3.273	2.933	2.692	3.125
21	5.633	5.404	7.100	4.838	5.125	5.000	5.545	5.667	5.231	4.667
22	4.327	3.769	4.340	7.243	3.899	4.063	3.909	4.133	4.385	3.500
23	5.714	4.962	4.340	4.405	6.608	6.875	7.000	7.400	6.231	5.917
24	4.551	4.462	3.940	5.784	4.812	4.750	5.000	5.600	5.000	4.333
25	4.163	3.654	3.680	5.270	4.225	4.250	4.545	4.533	4.308	4.000
26	3.878	3.654	3.800	6.514	3.675	3.875	3.455	3.867	3.692	3.542
27	6.020	5.962	3.980	4.027	7.425	6.812	6.909	7.333	6.846	8.375
28	6.224	5.981	3.820	3.919	7.662	7.312	7.273	7.467	7.231	8.375
29	4.265	4.327	4.540	5.730	3.887	3.687	4.000	4.600	3.846	3.625
30	4.388	3.902	3.800	6.676	5.012	5.313	5.455	5.600	4.692	4.542
31	6.286	6.327	4.020	3.432	7.612	7.062	7.000	7.667	7.462	8.208
32	3.551	3.365	3.900	7.081	3.337	3.687	3.364	3.267	3.308	3.167
33	5.490	5.288	3.740	3.432	6.487	6.125	6.273	6.933	6.923	6.208
34	4.184	4.135	4.900	7.081	4.075	4.312	4.182	4.267	3.846	3.792
35	6.082	6.731	4.660	3.405	7.062	6.687	6.909	7.333	7.308	6.875
36	4.408	3.904	4.380	6.649	4.150	4.250	4.182	4.533	4.231	3.750
37	4.224	3.808	3.160	4.054	5.037	4.500	5.273	5.333	5.154	5.000
38	3.918	4.096	4.000	5.622	3.875	4.125	3.727	4.000	3.692	3.833
39	4.245	3.808	4.200	6.973	4.200	4.437	4.636	4.600	4.077	3.792
40	5.061	4.558	3.640	4.459	5.950	5.750	6.364	6.200	6.231	5.583
41	5.245	4.635	4.620	4.270	6.387	6.750	6.455	6.600	6.231	5.958
42	6.082	6.096	4.360	3.622	7.487	7.375	7.364	7.867	7.385	7.417
43	4.878	4.519	3.580	3.757	6.150	6.187	6.727	6.400	6.385	5.625
44	4.408	3.865	2.920	3.694	5.287	5.062	5.818	5.800	5.385	4.875
45	4.551	3.769	4.360	6.108	3.810	4.000	4.545	3.857	3.769	3.583

ID	1634	4024	6044	8054	15X5	1525	1535	1545	1555	1575
46	5.469	5.635	3.800	3.514	6.612	6.125	6.636	6.800	6.769	6.708
47	3.980	3.481	3.740	7.054	3.899	4.000	3.909	4.200	3.917	3.708
48	3.878	3.577	3.960	5.622	3.925	3.875	4.000	4.200	4.000	3.667
49	5.939	5.558	3.740	3.351	7.175	6.937	6.545	7.200	6.538	7.792
50	4.959	4.346	3.460	3.811	5.762	5.812	5.909	6.133	6.000	5.417
51	5.388	5.462	7.060	4.973	4.787	4.812	4.636	5.133	5.538	4.125
52	4.673	4.442	3.500	3.324	6.375	6.437	6.273	6.733	5.692	6.500
53	6.408	6.865	4.040	3.811	7.387	7.562	6.909	7.600	7.692	7.000
54	3.857	3.365	3.500	6.541	4.012	3.812	3.909	4.200	4.538	3.708
55	4.939	4.577	5.000	3.568	4.762	5.187	4.727	4.600	5.308	4.292
56	4.959	4.942	6.840	4.946	4.177	4.125	4.364	4.933	4.462	3.542
57	4.347	3.750	4.980	6.108	3.380	3.625	3.455	3.533	3.538	3.125
58	3.408	2.923	3.800	6.757	3.190	3.250	3.364	3.667	3.385	2.917
59	5.041	4.423	3.520	3.865	6.750	6.937	7.000	7.200	6.462	6.333
60	5.020	4.865	7.020	5.622	4.612	4.812	4.455	4.800	4.846	4.250
61	6.265	6.173	5.940	4.514	6.300	5.750	7.364	7.000	6.846	5.542
62	5.571	5.981	4.300	3.278	6.275	5.562	6.182	6.667	6.692	6.292
63	5.531	5.615	6.920	5.514	5.437	5.375	5.364	5.667	5.923	5.042
64	4.020	3.923	3.520	3.459	4.250	4.250	4.182	4.533	4.154	4.167
65	4.347	3.981	4.360	6.622	4.112	4.187	3.364	4.067	4.462	4.167
66	5.551	5.400	5.540	4.378	5.587	5.875	5.000	5.600	6.538	5.125
67	4.265	4.250	5.140	6.459	3.837	4.250	3.727	4.000	3.923	3.500
68	5.592	4.941	4.380	4.108	6.812	6.812	6.636	7.067	6.846	6.625
69	3.898	3.731	4.240	7.378	3.575	3.687	3.636	3.733	3.692	3.333
70	4.776	4.212	3.920	5.649	5.212	5.125	5.727	5.733	5.462	4.708
71	5.714	5.212	4.740	4.676	6.487	6.625	7.000	7.067	6.769	5.667
72	5.714	5.712	7.420	4.811	5.137	4.937	5.000	5.667	5.538	4.708
73	3.776	2.769	3.286	4.324	3.537	3.562	3.818	3.800	3.692	3.292
74	3.592	3.250	3.140	4.162	3.512	3.687	3.727	3.600	3.462	3.375
75	2.959	2.608	3.080	4.622	2.962	3.062	3.000	2.867	3.000	3.000
76	5.041	5.288	3.320	3.595	6.387	6.125	6.455	6.600	6.231	6.500
77	4.020	3.692	3.720	7.486	3.950	4.063	3.909	4.067	4.000	3.833
78	3.531	3.212	3.580	4.486	3.312	3.625	3.545	3.267	3.077	3.375
79	3.816	3.846	4.240	7.486	3.600	3.625	4.000	3.667	3.615	3.542
80	5.959	5.462	4.480	3.703	6.900	6.687	6.364	7.267	7.154	6.792
81	5.612	5.596	7.551	4.514	5.237	5.125	5.545	5.933	5.462	4.667
82	6.347	6.462	4.540	3.568	7.600	7.500	7.000	7.267	7.538	8.083
83	3.592	3.519	3.880	6.865	3.537	3.750	3.909	3.600	3.385	3.333
84	4.429	3.942	4.000	7.297	4.200	4.375	4.182	4.467	4.385	3.833
85	4.020	3.423	3.660	5.378	3.911	4.125	3.818	4.400	3.846	3.542
86	3.469	3.212	4.100	7.054	3.266	3.187	3.364	3.667	3.538	2.958
87	5.204	5.212	6.980	4.811	5.089	5.187	5.455	5.733	4.923	4.583
88	6.061	6.173	4.120	3.811	7.612	7.625	7.364	7.533	7.154	7.958
89	5.612	5.692	4.020	3.081	7.262	7.125	7.182	7.600	7.308	7.083
90	4.878	4.423	5.340	6.946	4.875	4.875	5.273	5.333	5.154	4.333

ID	1634	4024	6044	8054	15X5	1525	1535	1545	1555	1575
91	5.776	5.538	4.400	3.027	7.100	6.500	6.909	6.800	6.692	7.917
92	5.878	5.346	4.700	3.946	6.900	6.937	6.818	7.133	6.923	6.708
93	5.469	5.462	4.140	3.459	6.750	6.687	6.364	7.067	7.231	6.375
94	4.878	4.596	4.204	7.622	5.287	4.812	5.273	5.667	5.462	5.208
95	4.146	3.942	4.551	7.324	4.100	4.375	4.273	4.400	4.000	3.667
96	6.163	6.231	7.327	6.270	6.075	5.875	6.727	6.333	6.692	5.500
97	6.408	7.212	6.080	4.054	7.437	7.437	7.545	7.667	7.769	7.083
98	3.837	3.212	3.306	4.000	3.687	3.875	3.818	3.733	3.385	3.625
99	6.245	5.692	5.918	4.270	6.687	6.875	6.818	7.267	7.077	5.875
100	3.776	3.962	3.860	5.405	4.225	4.437	4.091	4.733	4.308	3.708
101	4.816	4.615	6.500	4.054	4.537	4.812	4.545	4.933	5.077	3.792
102	4.633	4.423	5.960	5.378	4.587	4.875	5.091	4.933	4.538	4.083
103	5.204	4.827	6.900	4.622	4.500	4.688	4.818	4.933	4.769	3.833
104	5.122	4.827	6.960	4.703	4.900	4.812	4.727	5.200	5.462	4.417
105	3.571	3.077	3.340	5.081	3.650	3.438	4.091	4.267	3.615	3.333
106	2.918	2.288	2.280	3.108	3.387	3.375	3.364	3.467	3.692	3.208
107	5.694	5.365	5.600	4.838	6.800	6.937	7.000	7.133	6.846	6.333
108	5.625	5.538	4.720	4.514	6.437	6.812	6.455	6.800	6.308	5.958
109	4.531	4.314	3.360	3.324	5.350	5.500	5.545	5.533	5.692	4.917
110	5.347	5.038	6.920	4.784	5.089	5.187	5.455	5.800	5.154	4.417
111	5.021	4.692	4.100	5.568	5.392	5.062	5.727	5.667	5.615	5.174
112	2.857	2.577	2.800	4.514	2.911	3.062	2.545	3.000	2.923	3.042
113	6.612	6.404	4.560	4.432	6.152	6.062	6.182	6.733	6.538	5.583
114	6.327	5.981	7.420	4.944	6.062	5.938	6.091	6.600	7.154	5.292
115	6.898	7.314	4.360	4.378	7.787	7.937	7.273	7.800	8.077	7.625
116	5.592	5.519	7.800	4.946	4.750	4.937	5.091	5.333	4.923	4.125
117	5.102	4.731	5.620	6.432	4.350	4.562	4.455	4.667	4.692	3.875
118	2.735	2.212	2.220	3.622	2.825	3.062	2.818	2.933	2.923	2.625
119	6.184	6.038	7.500	4.811	6.512	6.687	7.000	7.200	6.923	5.625
120	5.224	5.404	7.240	5.027	5.325	5.625	5.545	5.733	5.615	4.667

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